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Air Pollution Technical Information Center
Research Triangle Park, North Carolina

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This periodical is published to announce technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, the bibliographic citation, an abstract, and the APTIC accession number are given. The subject fields are as follow: Emission Sources; Control Methods; Measurement Methods; Air Quality Measurements; Atmospheric Interaction; Basic Science and Technology; Effects-Human Health; Effects-Plants and Livestock; Effects-Materials; Economic Aspects; Standards and Criteria; Legal and Administrative; Social Aspects; and General and Miscellaneous. All abstracts are listed under one of the above subject fields. A subject and author index are included. The subject index consists of those terms that most clearly describe the information presented in the documents. The author index consists of personal authors which are arranged alphabetically. This issue contains 441 abstracts.

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NAPCA ABSTRACT BULLETIN
Vol. 1, No. 11 December 1970

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Author Index PA-1

Personal authors (maximum of five per document) are arranged alphabetically. The names are presented last name first. No distinction is displayed between senior and other authors. The title of the document is indented below the author's name. The APTIC accession number and the subject field where the abstract can be located in the Bulletin follow on the next line.

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INTRODUCTION

A

This bulletin is published to inform NAPCA personnel and others of technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, the NAPCA number, a bibliographic citation, and an abstract are given.

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As another service, abstracts of all the literature in APTIC (not just in a single issue of the NAPCA Abstract Bulletin) on any subject related to air pollution will be provided free of charge upon request. APTIC can search information more recent than that in the current issue of the NAPCA Abstract Bulletin because of the lapse time entailed by editorial, make-up, and printing work. For those who wish to browse through their own copies of each NAPCA Abstract Bulletin in a short period of time, subject and author are included in each issue.

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SUBJECT FIELDS AND SCOPE NOTES

1. EMISSION SOURCES

Information pertaining to an industry, process, or material associated with air pollution. Documents in this category are concerned primarily with characteristics of a specific class of emission sources including types, rates, industries; secondary coverage may include effects, control methods, etc.

2. CONTROL METHODS

Includes equipment and both specific source control and general abatement efforts. Included are documents describing the operating principles, design, operation, efficiency, etc., of equipment and methods of removing pollutants. The scope of the document can vary from a device for a specific source to an approach applicable to an entire industry —e.g., automobiles.

3. MEASUREMENT METHODS

Includes equipment as well as methods. Confined to development, testing and evaluation of pollutant determination methods (sampling, analytical, monitoring) and equipment, as such. Data obtained by use of methods in specific applications are placed in the applicable subject categories.

4. AIR QUALITY MEASUREMENTS

Pollution measurements in the ambient air, generally related to specific geographical locations, such as area surveys. Also includes general reviews of area situations and emission source inventories.

5. ATMOSPHERIC INTERACTION

All chemical and physical phenomena occurring in the atmosphere. Included is material on dispersion, air pollution forecasts, meteorological effects, topographical effects, photochemical reactions in the atmosphere, etc. Laboratory studies of photochemical reactions are assigned to Basic Science and Technology.

6. BASIC SCIENCE AND TECHNOLOGY

General discussions or data compilations for the basic physical and chemical properties of pollutants. Theoretical and laboratory studies on related chemical and biological reactions and mechanisms. Mass transfer and other basic knowledge related to process engineering applications in emission control or abatement. Excludes photochemical studies in the atmosphere and biochemical studies related to effects of air pollution.

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7. EFFECTS–HUMAN HEALTH

Covers medical and epidemiological studies; biological effects other than those on plants and livestock produced by air pollutants; laboratory animal experiments.

8. EFFECTS–PLANTS AND LIVESTOCK

Effects on vegetation–crops, trees, other plants–and on livestock as distinguished from laboratory experimental animals.

9. EFFECTS–MATERIALS

Deterioration, corrosion, etc., of physical materials, buildings, and structures.

10. ECONOMIC ASPECTS

Economic implications of air pollution and its control, e.g., economic losses from pollution damage, and costs of control programs or equipment in general.

11. STANDARDS AND CRITERIA

Recommended or adopted guides, criteria and standards for allowable emission limits or pollutant concentrations, air quality, equipment characteristics, and fuels.

12. LEGAL AND ADMINISTRATIVE

Legal aspects include legislation, ordinances, rules, litigation, hearings, decisions, etc. Administration covers administrative and miscellaneous information concerning control agencies and control and research programs. Typical topics are personnel, budgets, contractual activities and program descriptions.

13. SOCIAL ASPECTS

Sociological and psychological aspects such as social attitudes, public opinion studies, public relations, and public information.

14. GENERAL AND MISCELLANEOUS

Reviews of general problems, trends and background. Documents not assignable to other categories.

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NAPCA ABSTRACT BULLETIN

1. EMISSION SOURCES

PRODUCTION AND DISCHARGE OF TOXIC AND RADIOACTIVE GASES IN 'LINAC' TUNNEL IN FRASCATI.

(Produzione e scarico di gas tossici e radioattivi nel tunnel del Linac di Frascati). Laboratori Nazionali di Frascati del CNEN, Italy, LNF-65/21, Nota interna no. 282, 12p., June 28, 1965. 8 refs. Translated from Italian by D. A. Sinclair, National Research Council of Canada, Ottawa, 13p., 1968. CFSTI: N69-10248
M. Ladu, M. Pellicioni, and M. Roccella.
Identifiers: *Linear accelerator, Italy, Reactors (nuclear), Ventilation, Nitrogen dioxide (no2), Ozone, Radioactive radiation, Beta particles, Gamma radiation.

The production of the toxic gases ozone and nitrogen dioxide, and of the nuclides 0 (15), N (13) (radioactive beta (+)), and Cl (38) (radioactive beta (-) and gamma) in the tunnel of the linear accelerator at Frascati, Italy, are calculated on the basis of the specifications of the accelerator. The production of toxic gases in the tunnel is due principally to the ionization of the air by the electrons and the gamma rays of the shower coming from the wall of the accelerator tube. The contribution from electrons and from gamma rays are estimated separately for two cases, converter installed and converter not installed. Results show that in order to reduce the concentration of O_3 and NO_2 below maximum allowable levels, a ventilation rate of the order of 60 cu m/min is sufficient; the same rate creates safe conditions for the effect of any dose of the nuclides. Therefore, assuming no problems of residual radioactivity of the constituent material of the accelerator, the tunnel could be entered safely only a few minutes after termination of accelerator operation.
APTIC-15590

SOLVENCY AND SOLVENT RETENTION STUDIES FOR COMPLYING VINYL SOLUTION COATINGS.

J. Paint Technol., 41 (529):81-88, February 1969. 11 refs.
James E. Weigel, and E. George Sabino Jr.
Identifiers: *Solvents, *Regulations, *Chromatography, *Vinyl resin, *Surface coatings, Materials, Plastics, Analytical methods, Gas, Flame ionization method, Esters, Hydrocarbons, Aliphatic, Aromatic hydrocarbons, Toluenes, Ketones, Acetone, Fluid flow, Flow rates, Volatility, Administrative and social, Legal aspects.

Solvent systems for vinyl solution coatings have been significantly affected by the West Coast air pollution control regulations. Basic solvency information that has been developed to permit the formulation of complying vinyl systems is discussed. Data are shown which relate the composition of solvent systems to viscosity of vinyl chloride-vinyl acetate copolymer solutions. Solution properties of non-exempt and complying versions of vinyl solutions are compared. A gas-liquid chromatography method for the determination of retained solvents in dried films cast from these solutions is described. Data developed by this method is shown which relates solvent retention to solvent volatility. (Author Abstract)
APTIC-18133

REMOVAL OF HIGHLY VOLATILE HYDROCARBONS IN THE PETROCHEMICALS INDUSTRY THROUGH WASTE-WATER STRIPPING AND CATALYTIC PURIFICATION OF WASTE GASES.

For primary bibliographic entry see Field 02.
APTIC-18138

PEROXIDE REMOVAL USING LEAD DIOXIDE OR MANGANESE DIOXIDE.

(Shell Oil Co., New York) U. S. Pat. 3,306,846. 2p., Feb. 28, 1967. 6 refs. (Appl. Dec. 29, 1964, 4 claims.)
Kailash C. Salooja.
Identifiers: *Materials deterioration, *Gasolines, *Absorption, *Peroxides, Europe, Great britain, Fuels, Fuel oils, Control methods, Hydrocarbons, Metal compounds, Lead compounds, Manganese compounds.

A treatment for gasoline-range hydrocarbons to increase their storage stability and resistance to deterioration caused by peroxide formation is proposed. It has been discovered that peroxides can be removed from peroxide-containing hydrocarbons by contacting them at ambient conditions with lead dioxide, manganese dioxide, or a mixture of both. The treatment may be effected by any means, but examples of a coated rod or plate method and a fixed bed method are given. The process is also not limited to bulk quantities, and can be applied to garage gasoline storage tanks, automobile tanks, or refineries. The treatment is generally carried out at ambient conditions with hydrocarbon in the liquid phase. Amounts of dioxides, temperature, and time are not critical, but approximate values are given. Tests and table illustrating the effectiveness of the process are reviewed.
APTIC-18211

THE PROBLEM OF AIR POLLUTION-AND THE LEAR MOTORS LOW EMISSION VEHICLE DEVELOPMENT.

Preprint, UGI Corp., Harrisburg, Pa., 1p., 1970. (Presented at the Air Pollution Seminar, Harrisburg, Pa., March 24, 1970.)
Barlane R. Eichbaum.
Identifiers: *Automotive emissions, *Automotive emission control, Electric power production, Incineration, Domestic heating, Vehicles.

The control of ever-increasing air pollution has become one of the most urgent problems of today, the solution of which commands immediate and effective action. Air pollution is progressing in intensity daily and the effects on the health of the people of the nation and the deterioration of our flora and fauna are ever-continuing. Therefore, it is necessary to take immediate action to reduce the emission of air pollutants from all sources to harmless, unobjectionable levels. The primary sources of man-made air pollution are electric power plants, industrial plants, home heating, refuse disposal, and motor vehicles (which account for 60% of the total air pollution in the United States and 92% in some of our urban areas). Lear Motors Corporation has been most concerned with reduction of air pollution generated by the automotive vehicles. Statistics of automotive pollution are presented along with some of the developments at Lear Motors Corporation which present a means of reducing this environmental poisoning. (Author abstract)
APTIC-19769

THE FUSION TORCH. CLOSING THE CYCLE FROM USE TO REUSE.

For primary bibliographic entry see Field 02.
APTIC-19785

COMPARISON OF ASTM-A1 AND NATURAL GAS FUELS IN AN ANNULAR TURBOJET COMBUSTOR.

For primary bibliographic entry see Field 02.
APTIC-19790

TECHNICAL AND ECONOMIC CONSIDERATIONS FOR THE SELECTION OF SURFACE AND IN-GROUND STORAGE FOR LNG.

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THE REDUCTION OF SMOKE FROM GAS TURBINE ENGINES.

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FUTURE DEVELOPMENTS.

For primary bibliographic entry see Field 02.
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NEW TANKER TRENDS.

For primary bibliographic entry see Field 14.
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TRANSPORT OF LIQUEFIED GASES BY SEA. SPECIALIZED LOW-TEMPERATURE FLEET NOW OF LARGE PROPORTIONS.

For primary bibliographic entry see Field 02.
APTIC-19883

TRANSPORTATION OF LIQUEFIED NATURAL GAS BY RAIL AND BY HIGHWAY.

For primary bibliographic entry see Field 02.
APTIC-19887

STRUCTURAL FEASIBILITY STUDY OF PRESSURIZED TANKS FOR LIQUID-METHANE FUELED SUPERSONIC AIRCRAFT.

For primary bibliographic entry see Field 02.
APTIC-19888

TRANSPORT OF LIQUEFIED GASES BY SEA. SPECIALIZED LOW TEMPERATURE FLEET NOW OF LARGE PROPORTIONS.

For primary bibliographic entry see Field 02.
APTIC-19898

ON THE INFLUENCE OF EXHAUST OF AUTOMOBILE ON HUMAN BODY.

(Jidosha haiki-gasu niyoru osen kuki no jintai ni oyobosu eikyo no tsuite). Text in Japanese. Naika, 21 (5):813-819, May 1968. 13 refs.
S. Nishii.
Identifiers: *Toxicity, *Engine exhausts, Japan, Dusts, Engine operating cycles, Natural gas, Gasolines, Diesel engines, Automobiles, Air-fuel ratio, Dispersion, Meteorology, Lead compounds, Carbon dioxide, Carbon monoxide, Sulfur oxides.

Chemical substances within the automobile exhaust gas are carbon monoxide, carbon dioxide, methane or other carbon hydrates (including 3,4-benzpyrene and olefins), sulfur oxides, nitrogen oxides, etc. The concentration or amount of these chemical substances differs according to the kind, size, age, or driving condition of the engine. The air to fuel ratio also changes the composition of these substances. Carbon monoxide, carbon hydrates, and dust have higher concentrations under incomplete combustion due to the inadequate air to fuel ratio. Concentrations of CO_2, nitrogen oxides, sulfur oxides, and lead are increased with an increase of fuel consumption or an increase of engine rotation. Exhaust gas from a diesel engine has very low CO concentration (0.02 to 0.09%) and a high concentration of dust (0.3 mg/N cu m). The concentrations of CO and dust are the reverse of this in the exhaust gas from a gasoline or LPG engine. Nitrogen oxides show high concentration during acceleration or cruise with a high speed, and low concentration during idling. LPG engines emit higher concentrations of nitrogen oxides. The concentration of Pb (lead oxides or haloid lead) within the automobile exhaust gas is usually 2000 to 5000 micrograms/cu m. Automobile exhaust gas emitted to the ambient air is dispersed immediately after its emission. Dispersion and concentration of the emitted gas differs according to meteorological conditions, surrounding buildings, amount or density of traffic, and so on. The meteorological conditions play the most

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important role. Among chemical substances which have harmful effects on human bodies, CO is the most important, causing headache, thirst, drowsiness, or slight amnesia; the localized air pollution by CO is seriously observed in Japan (Tokyo and Osaka). In Los Angeles, photo-chemical products are most important, causing mainly irritation to mucous membranes (eyes, respiratory tract) or plants on the road. The radical procedures against air pollution due to automobile exhaust gas are (1) control and removal of harmful chemical components from the exhaust gas; and (2) improvement of the fuel.
APTIC-19940

THE METHANE PORT OF LE HAVRE.

For primary bibliographic entry see Field 02.
APTIC-19944

ANALYSIS OF THE NON-POLAR FRACTION OF GIANT RAGWEED POLLEN: CAROTENOIDS.

For primary bibliographic entry see Field 06.
APTIC-19945

DISPERSION AND DEPOSITION OF RAGWEED POLLEN FROM EXPERIMENTAL SOURCES.

For primary bibliographic entry see Field 05.
APTIC-19946

LEAD, DUST, AND SALT IN FIRN AND ICE FROM CAMP CENTURY AND BYRD STATION.

Antarctic J. U. S., 4 (5):218, Sept.-Oct. 1969.
M. Murozumi, T. J. Chow, and C. Patterson.
Identifiers: *Snow, *Lead compounds, *North pole, *South pole, Seasonal, Japan, Dusts, Sea salts, Silicates, Ice.

As determined [illegible] analyses of salts, dusts, and lead in firn and ice at Camp Century, Greenland, and at Byrd Station, Antarctica, lead concentrations in north polar ice sheets have increased from less than 0.001 gamma Pb/kg ice in 800 B. C. to more than 0.200 gamma Pb/kg ice, the sharpest rise occurring after 1940. Lead levels in south polar ice sheets are generally below detection limits before 1940 and rise only to about 0.020 gamma Pb/kg ice after 1940. The increase of lead with time in north polar snow is ascribed mainly to contamination from lead smelters before 1940 and to burned lead alkys after 1940. Differences between the concentrations in north and south polar snow are ascribed to barriers to north-south tropospheric mixing. Seasonal variations exist in the amounts of pollutant lead, sea salts, and silicate dust in polar snow; concentrations of lead and sea salts are two to three times higher in winter than in summer snow, while silicate dust concentrations are three times higher in spring than in winter snow. Special care was taken to avoid the contamination of ice samples, which were found to have a purity nearly equal to that of the purest laboratory water.
APTIC-19955

UNDERGROUND STORAGE OF LIQUID METHANE.

For primary bibliographic entry see Field 02.
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COMPRESSION OF NATURAL GAS.

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LIQUEFACTION OF NATURAL GAS.

For primary bibliographic entry see Field 02.
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ABOVE-GROUND STORAGE TANKS FOR LIQUEFIED NATURAL GAS.

For primary bibliographic entry see Field 02.
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NEW DEVELOPMENTS IN LNG CYCLES.

For primary bibliographic entry see Field 02.
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CLEARANCE STANDARDS FOR LNG STORAGE.

For primary bibliographic entry see Field 02.
APTIC-19986

BELOWGROUND STORAGE SYSTEMS FOR LNG.

For primary bibliographic entry see Field 02.
APTIC-19988

PRELIMINARY AIR POLLUTION SURVEY OF RADIOACTIVE SUBSTANCES: A LITERATURE REVIEW.

Litton Systems, Inc., Silver Spring, Md.,
Environmental Systems Div., NAPCA Contract
PH 22-68-25, Publ. APTD 69-46, 143p., Oct. 1969.
199 refs. CFSTI: PB 188092
Sydney Miner.
Identifiers: *Radioactive radiation, *Emission standards, Humans, Life span, Cancer, Leukemia, Particulates, Nuclear power plants, Missiles and rockets, Particle size, Impingers, Membrane filters, Filters, Iodine, Hydrogen, Carbon dioxide, Sulfur dioxide, Gases, Costs, Air quality standards.

Radiation effects on humans are of 2 types: biological (leukemia, cancer, shortened life span) and genetic, which is difficult to assess. Thus far, the radiation reaching the general public as a result of the nuclear power industry is insignificant compared with that from natural sources (radioactive minerals in the earth and cosmic ray activity), although the proposed expansion of the industry could give rise to problems from krypton-85. The nuclear weapons testing programs temporarily raised radiation levels 5-10% higher than those of natural sources. Maximum permissible concentrations for radionuclides released from nuclear plants have been set by the Atomic Energy Commission. The cost of control procedures used in the nuclear industry amounts to about 10% of the total cost of the plant. No data is presently available on the cost of damage from radioactive pollution of the atmosphere, but the atmospheric concentrations of radioactive substances can be determined by a number of highly accurate, sensitive methods. These include such sampling methods as filters, impactors, impingers, and settling trays. Particulate samples can be analyzed for activity and particle size. Among the radioactive gases analyzed are iodine, tritium, argon-41, krypton-85, xenon-133, xenon-135, carbon-14 dioxide, and sulfur-35 dioxide.
APTIC-19994

ROUNDUP OF LNG FACILITIES IN THE UNITED STATES.

For primary bibliographic entry see Field 02.
APTIC-20448

STUDIES OF ORGANIC SULPHUR IN COKE: SULPHUR-CARBONS FORMED BY PYROLYSIS IN CONDENSED PHASES.

Fuel, 49 (3):257-270, July 1970. 11 refs.
H. E. Blayden, and J. W. Patrick.
Identifiers: *Coke, *Organic sulfur compounds, *Pyrolysis, Great britain, Desulfurization of fuels, Sulfur compounds, Chemical bonds, Reaction mechanisms.

A comprehensive study of the formation and structure of carbon-sulfur complexes is described. A basis for the assessment of possibilities of controlling the organic sulfur content of coke is provided. An account is given of the formation and behavior of sulfur-carbons prepared by pyrolysis at temperatures between 300 C and 1100 C of (1) mixtures of organic materials with elementary sulfur and (2) organic sulfur compounds. The sulfur contents, thermal stability, chemical behavior, e.s.r. and x-ray diffraction exhibited by the sulfur-carbons were examined. In general the pyrolytic sulfur-carbons, with the exception of carbons formed from Thiokol polymer, showed no clear differentiation from sulfur-carbons sulfurized by reaction with sulfurous gases. It is suggested that they all contain essentially similar sulfur-carbon bonds, possibly of a thioether or disulfide character, at the periphery of exposed carbon hexagon layers. (Author abstract modified)
APTIC-22016

AIR POLLUTION INDOORS.

American Inst. of Medical Climatology,
Philadelphia, Pa., Proc. Symp. Air Pollution
Health, Philadelphia, Pa., 1966, p. 18-21. (April
21.)
Igho Hart Kornblueh.
Identifiers: *Buildings, *Non-industrial emission sources, Soiling, Residential areas, Engine exhausts, Aerosols, Smokes, Pesticides, Fuel gases, Water pollution, Chlorine, Oxygen, Ions.

Air pollution is caused indoors by common household activities, poor planning, and construction of many dwellings. In the kitchen, gas appliances consume large amounts of oxygen and produce a smoke containing potentially harmful matter. Chlorine, now used in the treatment of water, escapes with steam, fats, and oils in the process of cooking. The detergents used in laundering cannot be removed from the waste water and enter the rivers and lakes which supply water to large cities. The shelves of groceries hold bottles, boxes, cans, and sprays filled with a variety of compounds. Some remove the grease on stoves or in ovens, clean sinks, polish furniture, clean walls and floors, dispose of domestic insects, or freshen the air. It has been stressed that a mixture of two or more of the aerosols commonly used in the home may be toxic, but the market has not been affected. The ceiling above the basement garage is not air tight and allows the exhaust gases to enter the rooms on the floor above. Polluted air also soils bed and table linen, darkens and peels off paint, stains wallpaper, and smudges windows. The conductivity of the air depends on the presence of fast moving small ions of both polarities. Cooking, smoking, dusting, and cleaning lowers the concentration of small ions and leads to formation of the large ones, identical with those present in the heavily polluted urban atmosphere.
APTIC-22076

AN INVESTIGATION INTO THE SPONTANEOUS COMBUSTION OF DUSTS ENCOUNTERED IN THE GRAIN MILLING INDUSTRY.

(Badania nad samozapalnoscia pylow
wystepujacych w przemysle zbozowym). Ochrana
Pracy, 21 (5):18-21, May 1966. 11 refs. Translated
from Polish. Franklin Inst. Research Labs.,
Philadelphia, Pa., Science Info. Services, 11p.,
Oct. 24, 1969.
Slawomir Hulanicki, and Bohdan Glowiak.
Identifiers: *Dusts, *Flour processing, *Combustion, Europe, Temperature.

A study was conducted on the spontaneous combustion of flour dusts or dusts created in the course of its production. The spontaneous-combustion temperature of flour dusts and flours were determined by the Swietoslawski and Roga method and by the Hulanicki and Glowiak method. The device used to determine the self-ignition temperature of the dusts is described. Induction times were determined for all dusts at temperatures of 300 C, 320 C, 340 C, and 360 C, and their logarithms were plotted as straight lines. The dusts can be separated into two classes with respect to the ease with which they spontaneously burn: dusts from rye, wheat, and barley flours and dusts that are separated in the grinding operation, with a maximum safe temperature of 128 C; and dusts from the grain cleaning process, which are difficult to ignite, with a maximum safe temperature of 220 C. The spontaneous combustion temperatures of all the dusts which were studied by the

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Swietoslawski-Roga method vary within the range of 250g275 C. This range is hazardous for all operations that involve grain and flour dusts. The curves of temperatures of self-ignition vs induction times make it possible to determine self-ignition temperatures for any arbitrary induction time or to state how long it will take dust at a given temperature to reach the self-ignition point. (Author conclusions modified)
APTIC-22077

OPERATORS, MANUFACTURERS, GOVERNMENT JOIN THE BATTLE TO CONQUER AIR POLLUTION.

Fleet Owner, 61 (7):74-86, July 1966.
Personal Author Not Recorded.
Identifiers: *Automotive emission control, Federal governments, State governments, Legislation, Emission standards, California, Automotive emissions, Smog, Diesel engines, Automobiles, Engine design modification, Fuel additives, Inspection, Maintenance, Hydrocarbons, Carbon monoxide, Nitrogen oxides.

The contribution of automobiles to air pollution, methods of control, and pollution control legislation are discussed. Today, the term smog means any air pollution that creates haze, affects people, and damages property. The unburned hydrocarbons emitted by automobiles react with oxygen and nitrogen in the air, in the presence of sunlight, to form other compounds called photochemicals: aldehydes, nitrogen oxides, peroxides, and ozone. Combined with dust, they all contribute to haze. Carbon monoxide, though invisible, is also a primary vehicle pollutant. The Los Angeles air pollution goal is said to be '1940 air by 1970'. To meet this goal, California's standards, adopted in 10 counties for automobiles and light trucks, permit a maximum of 275 ppm hydrocarbons and 1.5% CO. Crankcase and exhaust controls are mandatory for all automobiles. Manufacturers of new cars must meet the emission standards set by the Clean Air Act. The maximum emissions permitted will be at least half of what new cars previously gave off. Diesel engines emit more nitrogen oxides and sulfur oxides than gasoline engines, and possibly carcinogenic substances. Government researchers are studying diesel odors and causes, different fuels, fuel additives, and injection techniques. Legislation passed by several states and cities and the control devices developed by several manufacturers are also discussed.
APTIC-22088

UNDERGROUND STORAGE OF LIQUEFIED NATURAL GAS: FIRST STUDIES AND PROJECTS OF GAZ DE FRANCE.

For primary bibliographic entry see Field 02.
APTIC-22117

ANALYSIS OF MINERAL MATTER IN COALS BY X-RAY FLUORESCENCE.

For primary bibliographic entry see Field 03.
APTIC-22126

2. CONTROL METHODS

CONTROL OF SO3 IN LOW-PRESSURE HEATING BOILERS BY AN ADDITIVE.

J. Inst. Fuel. 42 (337):67-74, Feb. 1969. 12 refs.

Identifiers: *Alkaline additives, *Research methodologies, *Sulfur oxides, *Particulates, *Residual oils, Carcinogens, Corrosion, Canada, Combustion products, Combustion gases, Stack gases, Settling particles, Soot, Sources, Boilers, Fuels, Fuel oils, Residual, Domestic heating, Analytical methods, Measurement methods, Particulate classification methods, Excess, Sulfur oxides control, Humidity, Acids, Sulfuric, Aldehydes, Hydrocarbons, Metal compounds, Aluminum compounds, Magnesium compounds, Vanadium compounds, Carbon dioxide, Carbon monoxide, Nitrogen oxides, Nitrogen dioxide (no2), Sulfur dioxide, Sulfur trioxide, Oxygen, Sulfur compounds, Sulfates, Combustion, Electrical properties, Electrical resistance, Pressure.

This paper deals with the burning of residual fuel oil containing 2.5% sulphur under conditions prevalent in heating boilers to assess the effect of boiler load, excess combustion air, mean residence time, and the use of a magnesia-alumina fuel-oil additive on the formation of noxious and corrosive products of combustion. Results show that the additive can be used as an effective substitute for low excess combustion air in reducing the emission of oxides of nitrogen and SO3. Futhermore, the additive neutralizes condensed H2SO4 and improves the electrical resistivity of soot particles to the point where electrostatic precipitation of soot is technically feasible. Detailed analyses of particulate matter samples taken from flames with untreated oil and oil treated with three different amounts of additive are described to elucidate the mechanism of acid soot neutralization and to obtain data on soot constituents that may contribute to atmospheric pollution. It is shown that the standard methods for measuring SO3 concentrations in flue gas can give misleading results when soot or particulate matter is present. (Author Abstract)
APTIC-18118

REMOVAL OF HIGHLY VOLATILE HYDROCARBONS IN THE PETROCHEMICALS INDUSTRY THROUGH WASTE-WATER STRIPPING AND CATALYTIC PURIFICATION OF WASTE GASES.

(Beseitigung leichtfluechtiger
Kohlenwasserstoffe in der Petrochemie durch
Abwasserstrippung mit katalytischer
Abluftreinigung.) Text in German. Staedtehygiene
(Uelzer/Hamburg), 20 (5):118, May 1969.
Karlheinz Trobisch.
Identifiers: *Hydrocarbons, *Control equipment, Germany, Sources, Industrial emission sources, Petroleum production, Catalytic afterburners, Control methods, Catalytic oxidation, Volatility.

The waste water of the Hoechst petrochemical plants contains, after leaving a separator, 1 kg of highly volatile hydrocarbons per 250 cu m waste water. Approximately 80% of the hydrocarbons are removed by allowing the water to trickle downward through a packed column, with regenerator gas plus air being fed through the same column in a countercurrent direction. The stripped water is further purified in a biological treatment plant, while the gas-air mixture passes through a catalytic afterburner in which the hydrocarbons are burned at 400 deg to CO2 and water vapor.
APTIC-18138

REMOVAL OF SULPHUR DIOXIDE FROM FLUE GASES.

Sulphur, 68:24-29, Jan./Feb. 1967.
Personal Author Not Recorded.
Identifiers: *Alkalized alumina (adsorption), *Manganese dioxide (japanese), *Penelec (contact process), *Reinluft process (adsorption), *Costs, Pollutants, Sources, Industrial emission sources, Control methods, Sulfur oxides control, So2 removal (combustion products), Administrative and social.

The direct-washing wet process was one of the earliest methods used for removing SO2 from flue gases with alkaline river water and ammonia being used in the scrubbers. The Mitsubishi process is a dual-purpose process for making sulfuric acid and hydrogen chloride on a commercial scale from SO2-containing waste gases. An aqueous solution of manganese oxide serves as the adsorbent. The Penelec contact process achieves acceptable SO2 removal consistent with low pressure drop, high heat economy, and low operating cost, rather than high product quality. The Kiyoura T.I.T. process utilizes a vanadium oxide catalyst for conversion of SO2 to SO3, and the addition of ammonia to form ammonium sulfate. Dry processes for the removal of SO2 include alkylized alumina, a process based on the absorption of SO2 in a hot solid followed by regeneration of the absorbent with a reducing gas and recovery of the sulfur. The Shell process is basically the alkylized alumina process with slight variations on the alumina. The Reinluft process is based on activated char which acts as an absorbent. Capital investment and 1967 running costs are given for all processes described.
APTIC-18208

REMOVAL OF NITROGEN OXIDES FROM EXHAUST GAS.

(Gaigasu chu no chisso sankabutsu no shoriho.)
Text in Japanese. Ryusan (J. Sulphuric Acid
Assoc. Japan), 20 (9):193-195, Sept. 1967.
Hiroshi Tsutsumi.
Identifiers: *Absorption, *Nitrogen oxides, *Nitrogen oxides removal, Japan, Chemical processing, Ammonia, Chlorine compounds, Nitric oxide (no), Nitrogen dioxide (no2), Nitrous anhydride (n2o3).

Nitrogen oxides (NO, N2O3, NO2, N2O4) are produced during the industrial manufacture of sulfuric acid, nitric acid, nylon, etc. Nitrogen dioxide gas, which is most harmful [illegible] humans, is water soluble and can be removed easily. Nitric oxide gas, which may be oxidized to NO2 in the air, is most difficult to dissolve in water and should be removed using chlorine and ammonium gases. Fuji-kasui industrial company uses a process in which nitrogen oxides are introduced with chlorine and ammonium gases into a tower the inside of which is covered with vinyl chloride or polypropylene where they are converted to ammonium nitrate. From 80% to 90% of all nitrogen oxides can be removed by this technique. This method is superior to nitrogen oxide removal systems employing pure water (removal ratio of 20 to 32.5%) or alkaline solution (27.9 to 40%).
APTIC-18213

PRODUCING SULFUR FROM HYDROGEN SULFIDE-CONTAINING GASES.

(Continental Oil Co., Ponca City, Okla.) U. S. Pat.
3,445,181. 5p., May 20, 1969. 2 refs. (Appl. Dec
30, 1964, 7 claims.)
Richard L. Every, and R. Leroy Grimsley.
Identifiers: *Hydrogen sulfide, *By-product recovery, *Design criteria, Natural gas, Scrubbers, Sulfur dioxide, Sulfur compounds, Chemical reactions.

An improved method for purifying gaseous materials which contain H2S is presented. Gaseous H2S is passed through substantially anhydrous liquid SO2 at -60 degrees C to -10 degrees C to produce solid S and H2O. The H2O occurs as ice and can be easily separated from the liquid SO2. Fifty percent or more of the solid S produced is yielded in the amorphous, carbon disulfide-insoluble form known as S mu. The method required no heat when carried out at atmospheric pressure, resulting in greater economy. The process is well adapted for purifying sour natural gas taken directly from the earth. Natural gas pressure may be employed to aid in condensing the SO2, and/or for removing the heat of reaction which occurs in the reaction of H2S with the SO2.
APTIC-18235

APPARATUS.

(Lummus Co., New York, N. Y.) U. S. Pat.
3,314,399. 3p., April 18, 1967. 4 refs. (Appl. Nov.
15, 1965, 11 claims.)
Adolf W. Gessner, Theodore J. Kayhart, and
Gordon L. Dibble.
Identifiers: *Furnaces, *Kraft pulping, *Sulfur compounds, *Black liquor oxidation, Industrial emission sources, Chemical processing, By-product recovery, Design criteria, Reduction.

This invention relates to a pulping recovery furnace for high sulfur reduction in which the net radiation heat flow between hearth and secondary

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combustion zones is reduced. Two modifications of the conventional recovery furnace are proposed. First, a refractory obstacle is placed above the hearth zone thereby reducing the net radiation flow and causing additional heat to be available for sulfur reduction. Second, the boiler tubing normally surrounding the hearth zone is removed. Heat normally lost at this point is thereby retained and utilized in the endothermic reduction of sulfites, thiosulfates, and sulfates. The passage of black liquor through the proposed furnace is described in detail.
APTIC-18240

METHOD AND APPARATUS FOR AFTERBURNING EXHAUST GASES.

(Assignee not given.) U. S. Pat. 3,444,687. 15p., May 20, 1969. 3 refs. (Appl. April 11, 1966, 19 claims.)
L. Andersson.
Identifiers: *Automotive exhausts, *Internal combustion, *Afterburners, *Control equipment, *Automotive emission control, Automotive emissions, Engine exhausts, Internal combustion engines, Design criteria.

This invention refers to an improved method of afterburning exhaust gases by mixing them with secondary air. The exhaust gases flow through at least one flow channel and are directed into an afterburner located in the flow channel. Secondary air is delivered to the afterburner in controlled amounts so that the temperature remains above 950 C which is above the ignition temperature of carbon monoxide. The afterburner comprises a plurality of vanes distributed throughout the cross-section of the flow channel for the injection of secondary air.
APTIC-18242

GAS TURBINE SMOG CONTROL FOR INTERNAL COMBUSTION ENGINE.

(Ford Motor Co., Dearborn, Mich.) U. S. Pat. 3,444,686. 3p., May 20, 1969. 4 refs. (Appl. Nov. 22, 1967, 8 claims.)
J. Knowles.
Identifiers: *Internal combustion engines, *Turbine engines, *Engine design modifications, Automotive emissions, Engine exhausts, Smog, Power sources, Gas turbines, Control equipment, Afterburners, Automotive emission control, Design criteria.

A power plant consisting of a combination of a reciprocating engine and a gas turbine, designed to decrease engine exhaust emissions, is presented. The turbine drives a compressor through a shaft in the conventional manner. The compressor receives air through an intake manifold fitted with a throttle valve. Compressed air from the compressor is delivered to a heat exchanger where it is heated by hot regenerator fluid. The heated air is fed into a combustion chamber where it is mixed with fuel and ignited by a glow plug. High pressure exhaust gases from the chamber are fed through a fluid conduit to the turbine nozzle and into the turbine. Exhaust gases from the reciprocating engine are carried by an interconnecting conduit to the heat exchanger, where they are mixed with O-rich gases bled from the turbine nozzle. The CO content of the reciprocating engine exhaust is oxidized to CO2 and more complete combustion of the unburned hydrocarbons takes place. Exhaust gases from the turbine are mixed with those from the reciprocating engine and fed to the turbine regenerator. Since the hot regenerator fluid is a combination of reciprocating engine gases, turbine exhaust gases, and nozzle fluid, combustion takes place and the regenerator fluid is at a much higher temperature than conventional regenerator fluid composed of turbine exhaust gases alone. This increase in temperature leads to a corresponding increase in the exit gas and temperature and higher turbine operating efficiencies.
APTIC-18243

ELECTROSTATIC PRECIPITATOR.

(Litton Systems, Inc., Beverly Hills, Calif.) U. S. Pat. 3,444,667. 5p., May 20, 1969. 12 refs. (Appl. March 1, 1968, 18 claims.)
D. D. Mullin.
Identifiers: *Electrostatic precipitators, *Design criteria, Suspended particulates, Control equipment, Electric charge.

An electrostatic precipitator in which particle laden air is first passed through an electric field where the particles receive an electric charge of one polarity and then passed through a second field where the charged particles are attracted to an electrode of opposite polarity is described. The collecting electrode is a rotatable disk over which a film of liquid flows outwardly from the center. The charged particles are electrically precipitated into the moving film of collector liquid and are collected. The precipitator has a cylindrical upper casing which houses the air inlet nozzle and the disk. The lower casing is rectangular in cross section and contains the supporting equipment such as motors, pumps, liquid containers, and power supply. Holes are provided in the bottom of the upper casing and the top of the lower casing through which the air to be cleaned passes. Flow rate through the precipitator is controlled by moving the upper casing with respect to the lower casing.
APTIC-18244

APPARATUS FOR ELECTROSTATIC PRECIPITATION OF DUST.

(Onoda Cement Co., Ltd., Onoda, Yamaguchi, Japan.) U. S. Pat. 3,444,668. 6p., May 20, 1969. 4 refs. (Appl. March 6, 1964, 3 claims.)
Senichi Masuda.
Identifiers: *Electrostatic precipitators, Tokyo, Control equipment, Dusts, Design criteria.

A high-efficiency device suitable for electrical precipitation of dust from gases is described. The system is composed of a drying device, at least one wet-system dust-precipitating chamber, at least one dry-system dust-precipitating chamber, and a means for receiving and transporting a water slurry of dust. The wet system chamber is provided with water spraying nozzles, dust-collecting electrodes, and discharge electrodes. The dust precipitated on the collecting electrodes is washed off with water sprays and the resulting water slurry is removed. The dry system is fitted with dust-collecting electrodes and discharge electrodes. A dust-containing hot gas is successively passed through the drying device, the dry, and the wet system chambers. The water slurry is fed into the drying device and is dried by the hot gases. The drying device can be of spray, rotary, or a through-circulation type.
APTIC-18245

APPARATUS FOR TREATING GAS.

(Assignee not given.) U. S. Pat. 3,444,670. 6p., May 20, 1969. 19 refs. (Appl. June 21, 1965, 3 claims.)
E. C. Hungate.
Identifiers: *Impingers, *Baffles, *Filters, Particulates, Control equipment, Scrubbers, Design criteria.

An improved air washing system incorporating a new eliminator structure for use in gas treating is described. The eliminator structure removes entrained particles from the gas stream and consists of a series of wall members on which the gas stream impinges. At least a portion of these members should be fabricated from a resilient and porous material. The system includes a housing with a passage containing the eliminator structure. A fan is used to provide air movement through the system. A filter for removing particles from the gas stream is also housed in the passage. A moveable chamber encloses a portion of the filter. Water discharged into the section of the filter in the chamber in the opposite direction to that of the gas flow effectively cleans the filter without affecting the operation of the filter or impeding the airstream through the system.
APTIC-18248

INCINERATOR HAVING IMPROVED SCRUBBER.

(Clear Air Waste Reduction Corp.) U. S. Pat. 3,447,287. 17p., June 3, 1969. 8 refs. (Appl. Dec. 18, 1967, 19 claims.)
Lester Hans Andersen.
Identifiers: *Fly ash, *Spray towers, *Incineration, Combustion products, Dusts, Chamber processing, Contact processing, Single chamber incinerators, Impingers, Control equipment, Scrubbers, So2 removal (combustion products), Absorption (general), Design criteria, Sulfur dioxide, Drying.

The specification discloses a scrubber and dryer apparatus particularly useful in conjunction with municipal incinerators for the removal of fly ash from gaseous combustion products. The scrubber comprises a chamber having surface-porous castable refractory piers in several staggered rows. In one embodiment, the chamber widens from front to rear and the spacing between adjacent piers in each succeeding row decreases. The ash is trapped by impingement on a continuous curtain of water disposed at the inlet of the scrubber just upstream of the piers. Water to form the curtain is pumped into a manifold set transverse to the chamber inlet in which there is a slot. The gases carry the water downstream in relatively large droplets to impinge on the piers where the water and trapped ash flows off. The dryer chamber comprises a deflecting arch with openings that direct the gases against the chamber walls and strips the water from them. The gases, after passing through the scrubber and then the dryer, are exhausted as substantially clear air, having a tested dust loading value of 54 to 68% below the commonly accepted standard of 0.85 lb dust/1000 lbs flue gas. In addition, the scrubber and dryer can be used for trapping SO2 in the production of sulfuric acid. (Author abstract modified)
APTIC-18252

PROGRESS IN THE REMOVAL OF SULPHUR COMPOUNDS FROM WASTE GASES.

Combustion, 5 (8):19-30, August 1933. 21 refs.
H. F. Johnstone.
Identifiers: *Bubble towers, *Catalytic oxidation, *So2 removal (combustion products), *Absorption, Combustion gases, Dusts, Control equipment, Scrubbers, Packed towers, Spray towers, Control methods, Absorption (general), Alkaline additives, Sulfuric acid, Sulfur dioxide, Catalysts, Oxidation, Catalysis.

Several methods of removing SO2 from waste gases are discussed. The possibility of economically washing large quantities of gases is very remote. Of the several types of washers in use, the bubble type is found to require the least time of contact and the smallest volume of washing space. A comprehensive study has been made of the catalytic oxidation method for removing SO2. For pure gases this method has the advantage of requiring only 1% of the water required for simple absorption. A by-product of sulfuric acid containing up to 40% acid may also be obtained. For flue gases from the combustion of coal, impurities render the catalysts inactive and not more than 4% acid may be produced. This method is available for washing small quantities of pure gases containing up to 12% SO2 and for which a bubble type washer may be used. Development of a regenerative system for recovering SO2 using alkaline reagents has also been started.
APTIC-18253

METHOD FOR REMOVING CHLORINE AND ENTRAINED ALUMINUM CHLORIDE PARTICLES FROM A WASTE GAS STREAM.

(Universal Oil Products Co., Des Plaines, Ill.) U. S. Pat. 3,445,182. 5p., May 20, 1969. 2 refs. (Appl. Feb. 15, 1965, 6 claims.)

J. P. Tomany.
Identifiers: *Absorption, *Spray towers, *Chlorine, *Aluminum purification, *Particulates, Industrial emission sources, Primary metallurgical processing, Control equipment, Scrubbers, Control methods, Design criteria, Aluminum compounds.

A method is described for scrubbing and removing C1 and entrained A1C13 particles in a gaseous effluent stream from an aluminum purification process. The waste gas is brought into contact with a liquid spray stream to effect an initial agglomeration and removal of a portion of entrained particles as well as humidification of the effluent stream by direct contact with the liquid. The humidified effluent is passed upward through a contacting zone having at least one stage of low density contact elements. The upward movement of the gas causes the contact material to form a loose, mobile, floating bed in this stage which is retained by a perforated barrier. An alkaline scrubbing liquid is introduced into the top of the stage to continuously wet the floating contact particles and to provide countercurrent contacting. The scrubbed gases are exited from the top of the contact zone and the spent liquid from the bottom. A typical scrubbing liquid for the process is a 5% NaOH solution.
APTIC-18255

MAGNESIUM-BASE COOKING LIQUIR PREPARATION BY ABSORPTION OF DILUTE SULFUR DIOXIDE IN FLOODED-BED TOWERS.

Tappi, 50 (10):64A-69A, Oct. 1967. (Presented at
the 20th Alkaline Pulping Conference, Tech.
Assoc. of the Pulp and Paper Industry, Richmond,
Va., Sept. 13-16, 1966.)
John E. Hanway Jr., E. B. Henby, and G. R.
Smithson Jr.
Identifiers: *Paper manufacturing, *Sulfites, *Absorption, Scrubbers, By-product recovery, Experimental equipment, Acids, Magnesium compounds.

The experimental and commercial development of a flooded-bed acid absorber used in connection with a newly developed chemical recovery system for treating magnesium-base sulfite waste effluents is described. The chemical recovery system involves the oxidation of the organic matter in the waste effluent in a fluidized-bed furnace and decomposition of the magnesium-sulfur complexes into granular magnesia and gaseous sulfur dioxide. The granular magnesia is used to prepare a magnesium hydroxide slurry for use as the absorbing medium to recover the sulfur dioxide present in relatively low concentrations (1.0 to 1.5 vol.%) in the exhaust gas and to produce a magnesium-base sulfite cooking acid. The type of acid-absorbing tower used is unique and its experimental development is described. The extrapolation of these data to commercial use in a 200-ton/day magnesium-base sulfite mill is covered. The development provides a simple but very efficient method for regenerating cooking acid from magnesium-base waste pulping effluents. Its potential may well cause an increasingly accelerated change within the next several years to magnesium-base sulfite pulping. (Author abstract modified)
APTIC-18262

ANALYSIS OF INFORMATION OBTAINED FROM THE JAPANESE O.E.C.D. DELEGATES AND THEIR ASSOCIATES REGARDING DESULFURIZATION OF MINERAL OILS AND STACK GASES. (SIC).

Organization for Economic Cooperation and
Development, Paris (France), Rept. RC (69)-12,
71p., April 2, 1969. 26 refs.
Alf H. Grennard.
Identifiers: *Fuel oil preparation, *So2 removal (combustion products), Japan, Sweden, Stack gases, Residual oils, Petroleum refining, Blending, Hydrodesulfurization, Manganese dioxide (japanese), Hydrogen, Hydrogen sulfide, Catalysts, Hydrogenation, Research programs, Costs, Federal governments.

The Japanese methods of removing sulfur from flue gases and residual fuel oils are discussed. Methods for desulfurizing stack gases include the Active Manganese Oxide Process and the Active Carbon Process. The development of stack gas desulfurization processes that will remove 90% or more of the sulfur in the flue gases are being investigated. There are essentially five methods in use to produce low sulfur fuel oils: selective blending of fuel oil components; conversion of high sulfur residuums by coking; vacuum gas oil hydrodesulfurization; deasphalted oil hydrodesulfurization; and direct residuum hydrodesulfurization.
APTIC-19646

USE OF HIGH-YIELD MULTISTAGE CYCLONE DUST FILTERS TO PURIFY FLUE GASES FROM HEATERS USING SOLID OR LIQUID FUELS.

(Impiego dei depolverizzatori multiciclonici ad
alto rendimento per la depurazione dei fumi di
caldaia funzionanti a combustibili solidi o liquidi).
Text in Italian. Termotecnica (Milan), vol. 22:27-
28, 44, 1968.
Luigi Brivio.
Identifiers: *Dusts, *Coal, *Fuel oils, *Centrifugal separators, Italy, Stack gases, Pulverized fuels, Operating variables, Particle size, Electrostatic precipitators, Fans (blowers), Filters, Design criteria.

A new cyclone dust filter is capable of differentiating the velocity of particles to be separated according to their granulometric size. Thus the speed of particles with a lower mass can be more closely adjusted to the speed of the transporting fluid, permitting a higher degree of assimilation, while larger particles are slowed down in proportion to their mass, minimizing the problem of wall erosion which is more intense in the case of larger particles. Such a filter is ideal for use in heating systems that employ an unpulverized solid fuel, but is less efficient when the fuel used is in a powdered form. This type of dust separator is also the most advantageous for use with liquid fuels or in cases where the coarser dust particles must be removed but the escape of very fine particles is not considered dangerous to the environment. The new filter system is economically advantageous for smaller plants, whereas for giant power plants or heating plants, the use of electrostatic precipitators become practical. The multistage cyclone is less efficient when there are wide variations in the load carried, a difficulty overcome by the use of a modulated control system, which maintains a constant dust load by recycling, as needed, a portion of the exhaust gases that have already been purified. The cyclone should be used in conjunction with an auxiliary fan, so as to compensate for the reduction in natural draft, which if uncompensated would increase the degree of incomplete combustion. With these factors taken into consideration, the new device is suitable for use in any sort of plant that consumes 1-50 kg per hour of liquid fuel.
APTIC-19724

CONVERSION OF METHANE TO CARBON DISULFIDE BY SULFUR DIOXIDE.

(Konversiya metana sernistym angidridom do
serougleroda). Text in Russian. Zh. Prikl. Khim.,
vol. 32:347-350, 1959. 10 refs.
V. T. Vdovichenko, N. P. Galenko, and A. V.
Larionov.
Identifiers: *Methanes, *Sulfur dioxide, *Carbon disulfide catalysis, Ussr, Natural gas, Desulfurization of fuels, Lead compounds, Carbon disulfide, Catalysis.

Production of carbon disulfide by reaction of natural gas (98% methane) with sulfur dioxide was investigated at temperatures ranging from 700-1000 C using a number of catalysts: alumina gel; bentonite; bentonite impregnated with Pb++ or Fe++; pumice impregnated with Pb++; and silica gel impregnated with Pb++. Pumice impregnated with 5% Pb++ by treatment with lead acetate proved to be the best catalyst, giving a maximum CS2 yield of 0.92 g/liter SO2 at 900 C with a CH4/SO2 ratio of 3.10.
APTIC-19725

ENRICHMENT FACTOR OF A SINGLE FRACTIONATING SIEVE PLATE.

For primary bibliographic entry see Field 06.
APTIC-19726

THERMODYNAMICS OF REDUCTION OF SULFUR DIOXIDE WITH METHANE.

For primary bibliographic entry see Field 06.
APTIC-19727

EFFECT OF TEMPERATURE ON THE RATE OF ABSORPTION OF SO2 FROM GASES.

(Vliyaniye temperatury na skorost'
pogloshcheniya SO2 iz gazov). Text in Russian.
Zh. Prikl. Khim., vol. 33: 9-13, 1960. 7 refs.
B. A. Chertkov, and D. L. Puklina.
Identifiers: *Temperature, *Absorption (general), Ussr, Ammonium compounds, Sodium carbonate, Sodium hydroxide, Sulfites, Reaction kinetics.

Absorption of sulfur dioxide in a 106 cm tube, which is 1.2 cm in diameter with irrigated walls, was studied at 10-50 C using different absorbers: ammonium sulfite-bisulfite solutions with SO2/NH3 ratios of 0.810 and 0.936, and solutions of sodium carbonate and caustic soda. The coefficient of mass transfer was found to drop slightly with increasing temperature in solutions of Na2CO3 and NaOH, but a much greater drop was observed with ammonium sulfite-bisulfite solutions of increasing concentration.
APTIC-19728

EFFECTIVENESS OF FLY ASH REMOVAL FROM FLUE GAS IN A FOAM BUBBLER.

(Effectivnost' ochistki dymovykh gazov ot
letuchey zoly v pennom barbotazhnom apparate).
Text in Russian. Teploenergetika, 6 (8):58-62, Aug.
1959. 4 refs.
B. A. Chertkov.
Identifiers: *Fly ash, *Bubble towers, Ussr, Stack gases, Boilers, Sulfur dioxide, Flow rates, Ph.

A four-tray foam bubbler was used to remove fly ash from flue gases of a 160-200 ton/hr boiler, fly ash content being 5-8 g/ cu m. Volumetric gas flow rates of 6000, 10,000, and 13,000 were studied with linear flow rates ranging from 1.4-3.05 m/sec. Efficiency was 97.5-98.8% at the higher flow rates. Total flow resistance of the bubbler averaged 160 mm H2O for a linear flow rate of 3 m/sec. Sulfur dioxide content of the discharge water varied from 0.35 to 0.70 g/liter, while acidity ranged from 6.2 to 9.8 mg-equiv/mole liter.
APTIC-19729

ROLE OF METHANE AND OTHER FACTORS IN CONTROLLING EMISSIONS FROM STEEL-MAKING PROCESS.

Open Hearth Proc., vol. 46:438-456, 1963. 5 refs.
George W. P. Rengstorff.
Identifiers: *Steel, *Smokes, *Primary metallurgical processing, *Methanes, Furnaces, Basic oxygen furnaces, Bessemer converters, Open hearth furnaces, Oxygen lancing, Process modification, Oxygen, Reaction kinetics.

Laboratory experiments on suppression of smoke from steel plant converters and furnaces were conducted to gain an understanding of smoke-forming mechanisms. Most of the studies were made in 2-in. diameter crucibles under one of several blowing conditions; the rate of smoke evolution for a given period was measured in milligrams per second. A specially-designed lance was used in which oxygen and methane were premixed in a water-cooled lance just before ejection through a single hole in the tip. The lance proved highly successful in suppressing smoke evolution when 4-

15% methane was added to the jet. The amount required appears to depend on jet velocity, characteristics of the flow of metal under the lance, and other dynamic conditions. Steam is far more effective than liquid water in suppressing smoke. Photographic evidence was obtained of the effect of methane additions, and emission and absorption spectrographs were made of the jet and of the gas above the surface of the metal during blowing with oxygen and with oxygen-methane mixtures. To study effects on a larger scale, a set of experiments was made on 50-lb heats under different oxygen-methane ratios; motion pictures of the results demonstrate the complete effectiveness of 15% methane on smoke suppression. A hypothesis of smoke suppression and formation is presented, although many questions remain to be answered. An addendum includes a discussion of reaction kinetics by several investigators.
APTIC-19732

A STUDY OF THE EFFECTS OF ELECTRIC WIND IN AN ELECTROSTATIC PRECIPITATOR.

Preprint, Air Pollution Control Association, New York City, 28p., 1969. 16 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 62nd, New York, June 23, 1969.)
O. E. Ramadan, J. J. Stukel, and S. L. Soo.
Identifiers: *Electric winds, *Electrostatic precipitators, Smokes, Kerosene, Photometric methods, Smokemeters, Flow rates, Ionization, Ions, Gases, Electrical properties, Corona, Electric charge, Voltage.

Electric wind in an electrostatic precipitator or the movement of gas induced by the repulsion of ions from the neighborhood of a high voltage discharge electrode was investigated. This included the measurement of secondary flow or electric wind velocity by a smoke tracer method and the measurement of density distribution of smoke particles by a photometer. The electric wind was emitted from each corona wire toward each of the collector plates in the form of jets; velocities increased with the corona voltage. Measurements were made on an elemental passage of a conventional electrostatic precipitator of 6-in. passage height and 3-in. spacing of corona wires along the center of the passage. Particles entrained in the air consisted of a 7-micron kerosene smoke. Flow velocities ranged from 5 to 15 fps, and corona voltages ranged from plus or minus 20-40 kV. The electric wind was influenced by the electric Reynolds number and the momentum transfer number, while the magnitude of maximum jet velocity of electric wind from the corona wire may be higher than the mean flow velocity. Comparison of theoretical (without electric wind effect) and measured results of density distribution and collection rate of particles is strongly influenced by the presence of electric wind. The electric wind promotes fluctuation in density of the particles and causes reentrainment of particles near the wall. If the electric wind effect can be suppressed or better utilized, much smaller precipitator dimensions would be feasible.
APTIC-19743

POSSIBLE SOLUTIONS AND EXPERIMENTS TO REDUCE THE SULPHUR CONTENT IN COKE.

(Moglichkeiten und Versuche zur Verminderung des Schwefelgehaltes im Koks. I.). Brennstoff-Chem. (Essen), 50 (5): 149-154, 1969. 11 refs.
Translated from German. Belov and Associates, Denver, Colo., 27p., April 3, 1970.
Josef Langhoff, and Werner Peters.
Identifiers: *Coke, *Coal preparation, *Hydrogenation, Germany, Primary metallurgical processing, Process modification, Magnetic separation, Solvent refining (low ash), Hydrogen, Organic sulfur compounds, Sulfides, Hydrogen sulfide, Pyrolysis, Recombination, Reduction, Flow rates, Temperature.

Sulfur occurs in coal in organically and inorganically bound forms. The inorganically bound sulfur appears as pyrite and markasite. About 65% of the coal-sulfur is organically bound. There are several possibilities for lowering the sulfur content in coke, including electrostatic and magnetic separation; treatment with gaseous, fluid, and molten reagents; decomposition by bacteria; introduction of solids or reducing or oxidizing gases during the coking process, and thermal decomposition of the coke. Another solution is the removal of the coal-sulfur by reduction or hydration with hydrogen during pyrolysis. By providing an excess of H2 at the moment of decomposition or rearrangement of the sulfur compounds, the formation of hydrogen sulfide and its simultaneous removal with the volatile components is assisted. This method is particularly well suited for the coking of fine coal in a rotating bed. Each grain of coal or coke is surrounded by the reaction gas, the effective surface presented to the gas is much higher. The possibility of H2S recombining with the solid particles to organically or inorganically bonded sulfur is limited by the rising effect of the carrier gas. Sulfur removal is better with an increasing length of stay and gas speed and with a reducing coke grain size. A temperature of about 800 C is optimal.
APTIC-19746

AN IMPROVED DEVICE TO REDUCE EXHAUST HYDROCARBONS DURING DECELERATION.

Preprint, Society of Automotive Engineers, Inc., New York, 19p., 1962. 13 refs. (Presented at National Automobile Week, Congress, Detroit, Mich., March 12-16, 1962, Paper 486H.)
Warren M. Wiese, Robert J. Templin, and Paul C. Kline.
Identifiers: *Engine exhausts, *Automotive emission control, *Hydrocarbons, Emission standards, Engine operating cycles, Operating variables, Automobiles, Engine operation modification, Spark timing, Design criteria, Experimental equipment.

Exhaust hydrocarbon concentrations are known to be very high during deceleration relative to other vehicle operating conditions. Because of this, considerable effort has been spent in developing devices which would reduce exhaust hydrocarbon emission during deceleration. The most promising of these was a manifold-vacuum limiting device; however, its adaptability was hampered by a serious loss of engine braking when the device was operating. An improved device has been developed to reduce the hydrocarbon content of automobile exhaust during deceleration. The new device utilizes the previously-known principle of manifold-vacuum limiting to reduce exhaust hydrocarbon concentration, but in addition, uses retarded engine spark timing to overcome the serious loss of engine braking encountered with previous devices. Retarding spark timing to about 10 ATC during deceleration restores engine braking to the same level as that of a standard car and thereby overcomes the major drawback to the use of deceleration devices of this type. For best overall performance, the device should be 'tailored' to match the operating characteristics of the particular vehicle. Data are shown to to illustrate how this is done. Several cars were equipped with the deceleration device and were tested under the conditions of the California Standards for Motor Vehicle Exhaust Emissions. California composite hydrocarbon concentration results indicate significant over-all reductions when the device is used, although these reductions are greatly lowered when the increased exhaust flow caused by use of the device is taken into account. The device is considerably more effective during decelerations beginning at 50 mph than during deceleration beginning at 30 mph. (Author abstract)
APTIC-19754

PROCESS FOR PRODUCING SULPHUR BY MEANS OF REDUCTION OF GASES CONTAINING SULPHUR DIOXIDE.

(Assignee not given.) Brit. Pat. 426,455. 2p., April 3, 1935. (Appl. June 12, 1934, 7 claims.)
Axel Rudolf Lindblad.
Identifiers: *So2 removal (combustion products), *Reduction, Great britain, Combustion gases, Particulates, Electrostatic precipitators, Iron oxides, Catalysts, Temperature.

A method for recovering sulfur from sulfur dioxide-containing gases obtained in the roasting of pyrites is described. To obtain a pure sulfur product it was previously necessary to purify the reducing gas, which involved cooling, then reheat the gas previous so its entrance into the contact chamber. Due to the loss of heat, the purification step adversely influenced the economy of the process. The process described is characterized by the fact that the hot producer gas is directly contacted with the SO2-containing gas. The SO2 gas should be heated before it is contacted with the hot producer gas, and the temperature of the contact chamber should be maintained at 700-800 C. The contact chamber is filled with a suitable catalyst, such as brick coated with iron oxide. An alkali compound in a finely divided state or dissolved in water is introduced into the chamber to form alkali silicates with the material of the chamber, and thus fresh catalytically active contact surfaces are always obtained. Exit gases are passed from the chamber through an electrostatic precipitator to remove solid impurities while they are so hot that the sulfur is present in the gaseous form.
APTIC-19762

TRACER STUDIES OF THE CATALYTIC OXIDATION OF SULFUR DIOXIDE.

Preprint, American Institute of Chemical Engineers, New York, N. Y., 21p., 1969. 11 refs. (Presented at the American Institute of Chemical Engineers, Annual Meeting, 62nd, Washington, D. C., Nov. 16-20, 1969.)
J. Happel, H. Odanaka, and P. Rosche.
Identifiers: *Catalytic oxidation, *So2 removal (combustion products), *Radioactive tracers, Combustion gases, Vanadium compounds, Oxides, Oxygen, Catalytic activity, Reaction kinetics, Reaction mechanisms.

The mechanism of the oxidation of sulfur dioxide over a vanadium pentoxide catalyst was investigated at 460 C. in an all glass, essentially gradientless reactor. Equilibrium was approached to varying degrees from the SO2-rich condition. Preliminary findings obtained using radioactive S (35) as a tracer indicate that steps involving sulfur account for some of the rate controlling elementary reactions but that oxygen chemisorption also appears to exert a considerable effect on the overall rate. Only at high oxygen concentrations does the reaction of SO2 with adsorbed oxygen appear to be the rate determining step. These findings may be of interest in seeking new catalyst formulations for the conversion of gases which are dilute in SO2.
APTIC-19764

THE PROBLEM OF AIR POLLUTION-AND THE LEAR MOTORS LOW EMISSION VEHICLE DEVELOPMENT.

For primary bibliographic entry see Field 01.
APTIC-19769

THE FUSION TORCH. CLOSING THE CYCLE FROM USE TO REUSE.

Atomic Energy Commission, Washington, D. C., Div. of Research, Rept. WASH-1132, 22p., May 15, 1969. 91 refs.
Bernard J. Eastlund, and William C. Gough.
Identifiers: *Nuclear power sources, Electric power production, Solid waste disposal, Ionization, Nuclear reactions, Gases.

Two applications of the fusion torch are discussed. First, it is used to reduce materials to their basic elements. The high thermal conductivity and large energy flux of the fusion torch plasma leads to shock vaporization and ionization of a solid. The result is that plasma energy is transferred to the solid on a time scale characteristic of the residence

11<

time of the solid in the fusion torch and without excessive impurity radiation losses. The plasma, composed of ionic species of the solid, proceeds into a separation region where a variety of techniques can be used to segregate the ionic species to either atomic number of atomic mass. Possible separation techniques include (a) electromagnetic, (b) quenching the plasma flow stream, (c) selective recombination, or (d) charge exchange. In fusion reactors, thousands of tons of material could be handled a day in a single plant. The handling of urban wastes then becomes a possibility. The second application of the fusion torch is to transform ultra-high temperature plasma energy into a radiation field by injecting trace amounts of selected materials into the torch. The radiation can be generated in the ultraviolet, transmitted through a window material, and absorbed in a bulk working fluid. A flux of ultraviolet energy as high as megawatts per square meter could be obtained if desired. Ultraviolet energy could be applied to any of the current uses of such energy, e.g., sterilization and photolysis. Fusion power offers the advantage that it releases no combustion products to the air and its reaction products are non-radioactive.
APTIC-19785

THERMAL CONSIDERATIONS IN EXHAUST EMISSION CONTROL SYSTEMS.

Preprint. Society of Automotive Engineers, Inc., New York, 24p., 1962. 16 refs. (Presented at the National Automobile Week Congress, Detroit, Mich., March 12-16, 1962, Paper 486J.)
C. M. Heinen.
Identifiers: *Automotive emission control, *Thermodynamics, Engine exhausts, Automobiles, Catalytic afterburners, Flame afterburners, Temperature.

The derivation of a simplified thermal evaluation of exhaust emission control systems is presented. Data on the operating cycles, exhaust flow, sensible heat of exhaust, exhaust composition, reaction heat of exhaust, secondary air requirements and on the sensible heat of secondary air were obtained. The AMA Traffic Survey cycles were adopted as an evaluation basis for the operating cycles. Carburetor air flow was measured on 318 cu in. V-8 engine. Temperatures of the exhaust stream of various cars with engines in the 300 cu in range were measured at various exhaust pipe locations, insulated or not insulated. Exhaust composition was determined with a hexane sensitized non-dispersive infrared analyzer. Since not all hydrocarbons are measured, a correction factor of 1.5 for HC15 values was used. The BTU/cu ft of exhaust were calculated for various concentrations of hydrocarbons and carbon monoxide for a fuel containing (CHsub 1.86x). Secondary air requirements were based on stoichiometric needs in accordance with the applicable chemical equations for oxidizing the various components to carbon dioxide and water. The method used for evaluating exhaust control systems consisted of four steps: (1) stating the temperature requirements and limitations of the system, (2) evaluation of the effect of temperatures obtained from sensible heat on the system, (3) evaluation of the effect of temperature obtained from heat of reaction plus sensible heat on the system, and (4) development of conclusions relative to the limitations of the system. The method was applied to two examples, a typical catalytic system and a representative flame afterburner system. These two examples showed that an approximate analysis of the thermal factors involved can be very useful in evaluating possible exhaust control systems. A conclusion common to both examples was that maintenance to a new car, condition of the ignition system, and the carburetion would be necessary to the functioning of the emission control system. One misfiring plug could kill the catalyst or melt down a flame-afterburner assembly.
APTIC-19786

COMPARISON OF ASTM-A1 AND NATURAL GAS FUELS IN AN ANNULAR TURBOJET COMBUSTOR.

National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center, TM X-52700, 26p., Oct. 20, 1969. 5 refs.
Donald F. Schultz, Porter J. Perkins, and Jerrold D. Wear.
Identifiers: *Natural gas, *Fuel oils, *Jet aircraft, Combustion gases, Smokes, Operating variables, Combustion, Pressure, Temperature.

A preliminary study was made to determine possible problem areas in the use of natural gas fuel in aircraft turbojet combustors. A combustor designed for Mach 3.0 cruise operation with liquid ASTM-A1 fuel was operated with natural gas. The only change made to the combustor was in the fuel nozzle itself. Only one natural gas fuel nozzle design was used for these tests. Combustion efficiency, outlet temperature profiles, blowout and relight characteristics, flame radiation and smoke emission data were obtained. A comparison was made with data obtained from the same combustor using liquid ASTM-A1 fuel. Combustion efficiency was 100% with both fuels at all conditions for which the inlet total pressure exceeded 30 psia (20.7 N/sq cm), the inlet air temperature exceeded 600 F (589 K) and the fuel-air ratio exceeded 0.01. As inlet air temperature was reduced below 600 F (589 K), the combustion efficiency with natural gas fell off more rapidly than with ASTM-A1. Some improvement in radial average outlet temperature profile was obtained with natural gas over ASTM-A1; however, local maximum temperatures were higher with natural gas than with ASTM-A1. Blowout occurred at much higher pressures and temperatures with natural gas. Relight characteristics were also much poorer than with liquid fuel. Flame radiation, combustor headplate temperatures, and smoke emission were lower for natural gas than for ASTM A-1 fuel. It is concluded that these results can only be taken to show possible problem areas, and that more complete and systematic studies are needed to determine their actual significance. (Author summary modified)
APTIC-19790

AIR POLLUTION CONTROL IN OXYGEN STEELMAKING.

American Inst. of Mining, Metallurgical and Petroleum Engineers (AIME), New York, N. Y., Proc. Open Hearth Steel Conf., 1961, p. 351-357.
J. H. Smith.
Identifiers: *Basic oxygen furnaces, *Electrostatic precipitators, *Design criteria, Steel, Dusts, Fumes, Open hearth furnaces, Primary metallurgical processing, Operating variables.

The air pollution control system and the results of tests and operation at a California steel plant are described. Electrostatic precipitation had not been tested on basic oxygen steel plants at the time the plant personnel were faced with the task of developing a satisfactory dust cleaning system for the proposed installation. Instead, it was necessary to rely on theory and adaptation of past experiences with the open-hearth electrostatic precipitators. Design specifications for three precipitators for the oxygen furnaces were established. Each of the three precipitators was designed to handle waste gases having a peak rate of 202,000 std cfm or 405,000 cfm at design operating conditions. Results of the performance tests are enumerated. Steam is introduced into the furnace gas stream at about 12,000 to 20,000 lb/hr from the start of the blow. There are seven banks of water sprays around the hood to cool the gases and condition them for the precipitator. The first sprays are automatically turned on at 500 F, and the last sprays, at 560 F. It is concluded that the electrostatic precipitators are a worthwhile investment and its use for dust cleaning in a basic oxygen system is recommended. However, certain design changes must be made.
APTIC-19792

TECHNICAL AND ECONOMIC CONSIDERATIONS FOR THE SELECTION OF SURFACE AND IN-GROUND STORAGE FOR LNG.

Inst. of Petroleum, London (England), Proc. Symp. Nat. Gas, London, England, 1966, p. 91-112. 16 refs.
G. M. Lauterbach.
Identifiers: *Compressed gases, *Costs, *Storage facilities, Concrete, Soils, Natural gas, Design criteria.

The three basic types of storage tanks for liquefied natural gas are double-wall above-ground tanks, frozen holes, and pre-stressed concrete. Selection of the optimum type must start with a detailed soil analysis. Above-ground tanks require firm bearing soil or piled foundations. Frozen holes require a high permanent water table and an impervious bottom. Pre-stressed concrete tanks may be built either above or in-ground; however, when built in-ground, the permanent ground water level must be below the tank bottom. In general, LNG storage costs about $6.00/brl ($1.70/Mscf) for basic storage and $10-12/brl ($2.85-$3.43/Mscf) for a complete peak shaving plant. In sizes below 150,000 brl, steel tankage would probably be cheaper. Between 150,000 and 400,000 brl all three types of storage are economical, and the relation of the site to the storage type will probably dominate the economics of the basic storage type. Above 400,000 brl multiple steel tanks would be required; therefore, single pre-stressed concrete tanks or frozen holes may become cheaper. There has not been sufficient information in these larger sizes to indicate any firm trend. A review of LNG storage economics must consider total operating costs as well as first investment costs. Primary in this analysis is a proper costing of boil-off expenses. This costing must include the incremental capital costs, as well as the operating costs of boil-off liquefaction. Final selection of LNG storage facilities must reflect the effect of all of these factors in combination to provide assurance that the most economic type of LNG storage is selected. (Author summary modified)
APTIC-19793

THEORY OF CHEMISORPTION. VIII. ABSORPTION RATE COEFFICIENT.

(Teoriya khimosorbtsii. VIII. O koeffitsiyente skorosti absorbtsii). Text in Russian. Zh. Prikl. Khim., 20 (10):963-975, 1947. 9 refs.
M. Ye. Pozin.
Identifiers: *Mass transfer, *Absorption, Ussr, Scrubbers, Mathematical analyses, Diffusion, Fluid flow, Liquids, Density.

A relationship is established for the rate of mass transfer through the diffusion layer of a liquid in the form of a function of dimensionless criteria characterizing the physical, hydrodynamic, and geometric conditions of scrubber operation. Exponential values for the expression for the absorption of a liquid film derived using similitude theory and dimension theory were determined experimentally and verify the analytically established relationship. With a change in linear velocity of a liquid flow, liquid viscosity, and absorbent density, all other conditions being equal, the exponential quantity describing the absorption coefficient remains constant.
APTIC-19796

PANEL BED FILTERS FOR SIMULTANEOUS REMOVAL OF FLY ASH AND SULFUR DIOXIDE: II. FILTRATION OF DILUTE AEROSOLS BY SAND BEDS.

Preprint, Air Pollution Control Association, New York City, 26p., 1970. 6 refs. (Presented at the Air Pollution Association, Annual Meeting, 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-29.)
Leon Paretsky, Louis Theodore, Robert Pfeffer, and Arthur M. Squires.
Identifiers: *Fly ash, *Filters, *So2 removal (combustion products), Stack gases, Aerosols, Electric power production, Gravity settling, Inertial separation, Mathematical modeling, Diffusion, Brownian movement, Flow rates.

Experimental studies of the filtration of dilute aerosols of Dow microspheres by beds of sand are reported. The experiments were conducted with flows passing vertically upward, vertically downward, and horizontally. The results were correlated reasonably well by semi-empirical, semi-theoretical considerations taking into account collection by diffusion, gravity settling, direct interception, and inertial impaction. The results are preliminary to experiments to be made on filtration of aerosols by a filter cake of fly ash resting upon a sand bed. An effective filter of this type could be used to reduce fly ash and sulfur dioxide emissions from power generators. The experimental results show that a velocity of maximum penetration exists. Reduction of the aerosol filtration data to single particle collection efficiencies indicates that there is no effect of bed height on the single particle collection efficiency. Experimental single particle collection efficiencies are larger for the finer sand. At low velocities, the primary means of capture is by diffusion, the influence of which decreases as the velocity increases. The 'free surface model' predicts that collection by Brownian diffusion depends only on the dimensionless Peclet number and a complex function of the bed porosity. The effect of gravity settling is superimposed on the other mechanisms. Gravity settling is an appreciable effect at velocities less than 1 cm/sec for the 1.1 micron polystyrene aerosol, but its influence decreases with increasing velocity. Gravity settling is responsible for the difference in the upshot and downshot efficiencies at low velocities. For a given size aerosol it is independent of sand size. Filtration efficiencies of aerosols by direct interception can also be predicted using the free surface model. The influence of direct interception is independent of velocity and depends only on aerosol and collector size, and be porosity. Prediction of single particle efficiencies by inertial impaction using the free surface model confirms the existence of a critical value of the inertial parameter, and is in agreement with the value reported in the literature for a voidage. The critical inertial parameter decreases with decreasing porosity.
APTIC-19834

CANVEY ISLAND EVAPORATORS.

Petrol. Times, vol. 68:635, Dec. 11, 1964.
Personal Author Not Recorded.
Identifiers: *Evaporators, *Methanes, *Compressed gases, Corrosion, Aluminum, Steel, Zinc, Sea salts, Design criteria, Propanes, Heat transfer, Water.

Two evaporators, each with a capacity of 50 tons/hr of liquid methane, are described. One uses sea water at ambient temperature as the direct heating medium for evaporating the liquid methane. The heat transfer surface consists of a series of panels, each made from a large number of aluminum extrusions in the form of tubes with two external fins. All components in contact with methane are of aluminum. The external surfaces of the panels are clad with a zinc-aluminum alloy layer for protection against sea water corrosion. The second evaporator is more complex and uses liquid propane as an intermediate heat transfer medium. It has increased efficiency and eliminates icing of the heat transfer surfaces. It is designed so that it can be converted, by adding a circuit containing a superheater, expansion turbine, and propane condenser, to provide some of the electricity used at the terminal. This evaporator consists of a killed steel kettle containing propane and methane evaporators made from aluminum alloy. The controls of both types of evaporators provide automatic cut-off of the liquid methane should the water supply fail.
APTIC-19842

PILOT LIQUEFIER TO GAS FIELD.

Chem. Eng., vol. 72:94, May 10, 1965.
Personal Author Not Recorded.
Identifiers: *Natural gas, *Pilot plants, *Compressed gases, *Liquefaction plant, Portable, Chromatography, Design criteria, Fluorinated hydrocarbons, Ethylene, Carbon dioxide, Fluid flow, Water, Thermodynamics, Pressure, Temperature, Portable.

A skid-mounted pilot facility was built to furnish design information for building new full-scale natural gas liquefaction plants or revamping existing ones. Specific information gathered by the pilot plant includes: data on vapor-liquid equilibrium constants and other thermodynamic properties; data on separating heavy and light ends from liquefied gas; effects of varying gas composition and process conditions; and evaluation of particular gas compositions with respect to liquefaction. Data can be collected on pressure, temperature, and flow, as well as being stored for computer use. The unit can extract heavy and light ends from natural gas, and has a system for removing carbon dioxide and other undesirable components. A cascade cycle liquefies the product: the natural gas is condensed by ethylene refrigerant, which is condensed by fluorocarbon, which is condensed by water. Gas can be withdrawn through sample lines for chromatographic analysis. For its operation, the unit requires water, electricity, and compressed air.
APTIC-19844

FUEL BURNING PROCESS AND APPARATUS.

(Combustion Engineering, Inc., Windsor, Conn.)
U. S. Pat. 3,320,906. 4p., May 23, 1967. 5 refs.
(Appl. April 20, 1966, 7 claims).
George Domahidy.
Identifiers: *Scrubbers, *Alkaline additives, Stack gases, Dusts, Fly ash, Coal, Furnaces, Steam plants, Sulfur compounds, Limestone.

A method is described for removing sulfur compounds and particulates such as dust particles and fly ash from flue gases of steam generating and similar equipment. The furnace portion contains a plurality of burners which feed a mixture of pulverized coal and primary combustion air into the furnace chamber. Limestone or dolomite is injected into the flue gases to react with the sulfur compounds. A wet scrubber promotes the reaction and removes the reaction products and other particulate matter from the flue gas stream. The gases are reheated after wet scrubbing to prevent any visible plume or localized pollution due to the low temperature nonbuoyant gases issuing from the scrubber.
APTIC-19845

THE REDUCTION OF SMOKE FROM GAS TURBINE ENGINES.

Aircraft Eng., 41 (7):28-31, July 1969. 7 refs.
T. Durrant.
Identifiers: *Gas turbines, *Air-fuel ratio, Carbon black, Great britain, Smokes, Jet aircraft, Visibility, Photometric methods, Particle size, Particulate sampling, Engine design modification, Fuel oil preparation, Design criteria, Combustion, Pressure, Temperature.

Exhaust smoke emission from high pressure ratio aero gas turbine engines currently in service was reduced largely by attention to fuel air mixing in the combustion chamber. Aerated fuel injection devices allow improvements in smoke control beyond those obtained by previously proved design methods using pressure jet atomizers. Methods of aerated injection now available are the walking stick and airspray designs. Increases in combustion air inlet temperature and turbine entry temperature help to offset the effect of the operating pressure producing more smoke. Fuel preparation can considerably influence carbon production, and low orders of carbon concentration can occur by reducing fuel droplet size and controlling fuel distribution. To define the acceptable levels of smoke emissions, theoretical models are being developed using the optical properties of carbon particles. The data necessary to predict the relative level of smoke visibility are also included.
APTIC-19846

PURIFICATION OF EXHAUST GASES FROM NITRIC ACID PLANTS.

Brit. Chem. Eng., 14 (5):667-668, May 1969. (Also: Khim. Prom. (Moscow), vol. 7:517, 1968.)
E. A. Kazakova, R. Z. Khiterer, and V. E. Bomshtein.
Identifiers: *Adsorption, *Nitrogen oxides, Great britain, Ussr, Stack gases, Dusts, Chemical processing, Centrifugal separators, Design criteria, Nitric acid, Nitric oxide (no), Nitrogen dioxide (no2), Silicon dioxide, Oxidation, Temperature.

A method for adsorbing the exhaust gases from a nitric acid plant is discussed. Exhaust gases were cooled with water and brine to O C, and after separation of condensate, entered the 500 mm diameter adsorption column. This has 22 trays spaced at 400 mm, and fluidized silica gel flows from tray to tray, countercurrent to the gas stream. Nitric oxide is partly oxidized to nitrogen dioxide and is adsorbed on the silica gel. The adsorbent saturated with NO2, is withdrawn from the adsorber and passed to the desorption column. This column is heated with steam to 180 to 190 C, while an air current desorbs the silica gel. The desorption products, containing 65% acid vapor, water, NO2, nitrogen, and oxygen, after dedusting in a cyclone, are returned to the process. It was found convenient to locate the adsorption column above the desorber, and to conduct both operations at 5 atm. A gate valve controls the flow between columns; a penumatic conveyer transfers the adsorbent from column base to column head. By raising the temperature in the desorber to 190 C, the nitrogen oxides concentration can be reduced to 0.01%.
APTIC-19847

FUTURE DEVELOPMENTS.

American Public Power Assoc., 1966, Chapt. 13, p. 343-360.
Claud R. Erikson.
Identifiers: *Mass transportation, *Automobiles, Research programs, Federal governments, Electric propulsion, Design criteria, Alcohols, Hydrogen, Oxygen.

There is a definite and growing potential market for electric vehicles of all types, which is recognized by domestic and foreign automobile manufacturers. Foreign automobile manufacturers appear to be closer to marketing an electric car than do the U. S. auto makers. One reason for this is that gasoline costs abroad are twice those in the United States. Batteries which would power such vehicles are expensive, but there are various schemes for financing batteries for consumer use in passenger cars. The overall maintenance of an electric car should be much less than for a gasoline car. It is expected that the federal government will play an increasing role in public transportation. The bulk of proposed legislation concerned directly with electric vehicles will concern the sponsorship and financing of research and development of prototype vehicles. Many safety standards being developed by industry and government will apply to electric powered cars. It is thought that fuel cells will become the best source of electric power for electric driven vehicles. A variety of fuels can be used, with hydrogen and oxygen being the most practical for automobiles. Motor design and special features of electric automobiles are also discussed.
APTIC-19851

REMOVAL OF SO2 GAS IN EXHAUST GAS BY STEAM-GENERATED ACTIVATED CHARCOAL PROCESS (II). ABSORPTION OF SO2 GAS IN EXHAUST GAS BY ACTIVATED CHARCOAL.

Translated from Japanese. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 3p., Oct. 30, 1969.
Yasumi Kamino, Shigenori Onizuka, Kenji Yasuda, Masaaki Miyaji, and Yoshihiko Kawamura.

Identifiers: *Charcoal, *So2 removal (combustion products), Japan, Stack gases, Operating variables, Absorption (general), Reaction kinetics.

In a comparative study of the absorptive efficiences of four kinds of activated charcoal (AC-Q, AC-Gl, AC-Sh, and AC-C) for sulfur dioxide, the saturation value of absorption was determined by thermal balance measurements. In addition, the effects of gas velocity and SO2 concentration and water content on absorption were evaluated. The results show that AC-Q is superior to the other activated charcoals and that the removal rate of SO2 is a function of time of absorption and volume of treated gas.
APTIC-19852

THE SORPTION OF SULFUR DIOXIDE IN A CYCLED COLUMN: A COMPARISON STUDY.

Pennsylvania State Univ., University Park, Center
for Air Environment Studies, NAPCA Grant AP
00022, Publ. 116-69, 115p., March 1969. 21 refs.
William D. Morgan.
Identifiers: *Scrubbers, *Absorption (general), Carbon black, Stack gases, Operating variables, Water.

A method for scrubbing sulfur dioxide from air was tried and proved moderately successful. A liquid suspension of carbon and water was used as the liquid in a controlled-cycle column. Experiments were performed with a basic one sieve plate column. Analysis of the outgoing vapor stream was done by bubbling it through a hydrogen peroxide solution and titrating the resultant sulfuric acid with a standard solution of sodium hydroxide. Overall efficiencies obtained under a variety of conditions were compared. The column was operated continuously and cycled. The liquid was either plain water or the carbon-water suspension. During the various runs, the following conditions were varied: the mass flow rate of gas, the liquid cycle time, the vapor cycle time, the liquid rate (for continuous runs), and the inlet concentration of SO2. The best overall efficiencies were obtained when the column was cycled using the carbon-water suspension. A liquid cycle time that allowed all the liquid on the plate to be replaced for each cycle, and low mass flow rates of gas also gave high efficiencies. The inlet concentration of SO2 and the efficiency were independent of each other. (Author abstract modified)
APTIC-19855

ON THE RECOVERY OF SO2 FROM WASTE GASES FROM CONTACT SULFURIC-ACID PLANTS.

(K voprosu Izvlecheniya SO2 iz otkhodyashchikh
gazov kontaktnykh Sernokislotnykh zavodov).
Text in Russian. In: Tr. Ivanovsk. Khim. Tekhnol.
Inst., no. 2, p. 56-70, 1939.
V. F. Postnikov, and T. I. Kunin.
Identifiers: *Contact processing, *Absorption (general), *Sulfuric acid, Ussr, Stack gases, Quinolines, Water.

The use of a quinoline-water mixture as a sulfur dioxide absorber was studied experimentally, and a 1:1 ratio was found to be optimum. Absorption was significant, but neither the degree of SO2 accumulation, nor the frequency of regeneration, were determined. Studies were made at 20-100 C with gas mixtures containing 0.7% SO2 and 0.2-0.3% SO3, and with gas flow rates ranging 0.09-0.24 m/sec.
APTIC-19856

STUDY ON REFINING SULFUR BY FLUIDIZING METHOD. (REPORT NO. 1). SO2 GAS REDUCTION IN A FLUIDIZED BED.

Kogyo Kagaku Zasshi (J. Chem. Soc. Japan), 63
(6):906-911, 1960. 15 refs. Translated from
Japanese. Franklin Inst. Research Labs.,
Philadelphia, Pa., Science Info. Services, 20p.,
Nov. 5, 1969.
K. Hirose, I. Yano, and S. Mikami.
Identifiers: *So2 removal (combustion products), *Reduction, Japan, Combustion gases, Coke, Operating variables, Carbonyls, Sulfur compounds, Carbon disulfide, Hydrogen sulfide, Flow rates, Temperature.

As part of a study of the refining of sulfur from pyrite ores by fluidization, reduction of sulfur dioxide gas by coke in a fluidized bed was investigated. The effects of reaction temperature, gas composition, gas flow rate, and the volume of coke on the reduction reaction were examined. Above 1000 C, a 100% reduction of sulfur dioxide was obtained by prolonging the period of gas-coke contact. However, hydrogen sulfide, carbonyl sulfide, and carbon disulfide were formed as the result of simultaneous side reactions. These side reactions were minimized by reducing the reaction temperature and extending the contact time still further, but sulfur yields were not satisfactory. Complete conversion of sulfur dioxide to sulfur appears to require its reaction with hydrogen sulfide or carbonyl sulfide. Experiments were also performed in a fixed bed. The fixed bed data and the fluidized bed data were compared and mathematically analyzed to determine the quantity of sulfur dioxide reduced by the coke and the quantity reduced by the carbon monoxide formed from the carbon dioxide generated by the coke. The effect of flow conditions on reduction rate coefficients is discussed.
APTIC-19859

DESULFURIZATION PROCESS OF FLUE GAS BY ACTIVE CARBONS.

(Kassaitanho hai gasu datsuryu). Hitachi Hyoron,
49 (11):53-57, Nov. 1967. 3 refs. Translated from
Japanese. Franklin Inst. Research Labs.,
Philadelphia, Pa., Science Info. Services, 22p.,
Nov. 4, 1969.
Zensuke Tamura, Yukio Hishinuma, and Teruo
Hisamura.
Identifiers: *Carbon black, *Adsorption (general), Japan, Stack gases, Pilot plants, By-product recovery, Sulfuric acid, Sulfates.

In a Japanese process for desulfurizing flue gas, sulfur dioxide is adsorbed by activated carbon which is regenerated by washing and drying. A standard operating cycle including adsorption, washing, and drying is 60 hrs. A 90% desulfurization rate was obtained when the process was operated for about 2300 hrs (60 cycles) in a test plant. No weakening in the adsorptive capacity of the carbon was observed and dilute concentrations of 20% sulfuric acid were obtained continually from the washing water. The method is to be tested again in a large-scale pilot plant. Advantages claimed include excellent flue-gas diffusion, since the exothermic adsorption reaction maintains stack temperatures in excess of 100 C, reclamation of sulfuric acid and sulfates from the wash water, conservation by re-use of washwater, and adaptability to existing boiler structures without boiler modification. Several other dry methods of desulfurization are also described.
APTIC-19860

METHODS OF PRODUCING ELEMENTAL SULPHUR BY REACTION BETWEEN SULPHURETTED HYDROGEN AND SULPHUR DIOXIDE.

(Imperial Chemical Industries Ltd., London
(England) and Bolidens Gruvaktiebolag,
Stockholm (Sweden)) Brit. Pat. 524,344. 2p., Aug.
5, 1940. (Appl. Jan. 27, 1939, 5 claims).
Axel Rudolf Lindblad, and Fritz Olov Hemeryd.
Identifiers: *By-product recovery, *So2 removal (combustion products), *Hydrogen sulfide, *Catalysts, Cements, Great britain, Sweden, Combustion gases, Calcium sulfates, Iron compounds, Sulfur compounds, Reduction, Gases, Vapors, Temperature.

Sulfuretted hydrogen (hydrogen sulfide) and sulfur dioxide can be almost completely converted to elemental sulfur at 120-450 C by passing the gas mixture over catalyzers of cement (Portland or aluminate) or gypsum. These compounds possess the property of being able successively to take up and give off water at the temperatures in question. The sulfur content of the gas after the reaction is in the form of vapor containing only minor quantities of S2 molecules. The catalytic effect of the compounds is further increased by mixing them with sulfurous pyrites, pyrite concentrate or other metal compounds that can be reduced with the formation of sulfides. The process eliminates the expense and difficulties associated with the extraction of sulfur in the solid state and which are the consequence of working at higher temperatures and with iron or bog ores as catalyzers.
APTIC-19861

IMPROVEMENTS IN THE SEPARATION OF SULPHUR OXIDES FROM WASTE GASES.

(Badischen Anilin und Soda Fabrik, A. G.,
Ludwigshafen (West Germany)) Brit. Pat. 896,457.
3p., May 16, 1962. (Appl. Aug. 31, 1960, 4 claims).
Guenther Hamprecht, and Herbert Meisiel.
Identifiers: *Catalytic oxidation, *So2 removal (combustion products), Germany, Combustion gases, Baffles, Scrubbers, By-product recovery, Ammonium compounds, Sulfates.

Aqueous ammoniacal solutions used to wash gases containing sulfur oxides and oxygen can be oxidized to ammonium sulfate by evaporation without previous purification and at temperatures below 70 C by introducing the gas containing sulfur oxides with ammonia to a reaction tower where rapid mixing of the gases is achieved by the introduction of filler bodies or baffles. The tower is charged with active carbon which catalyzes the oxidation of the atomized ammonium sulfate formed by the reaction that proceeds at 40-45 C and at 1 atm. Before or during the reaction, the waste gases are moistened with hot water or steam.
APTIC-19867

METHOD OF TREATING EXHAUST GASES CONTAINING SULPHUR DIOXIDE.

(Toyo Koatsu Industries, Inc., Tokyo (Japan))
Brit. Pat. 1,087,028. 5p., Oct. 11, 1967. (Appl. June
28, 1966, 11 claims).
Personal Author Not Recorded.
Identifiers: *Catalytic oxidation, *So2 removal (combustion products), Japan, Stack gases, By-product recovery, Ammonium compounds, Vanadium compounds, Oxides, Sulfates, Solids.

When exhaust gases containing sulfur dioxide are discharged into the atmosphere, they contaminate it. Wet processes remove SO2 by washing exhaust gases with water, aqueous ammonia solution, aqueous manganese oxide suspensions, or aqueous chalk suspensions. However, these processes are expensive, the temperature in the washed exhaust gas is reduced, and the washed exhaust gas contains smoggy substances and, therefore, is not diffused well into the upper atmosphere. Dry processes include oxidation of SO2 to SO3, dry absorption with a solid absorbent, adsorption with any adsorbent. However, the apparatus is corroded by the sulfuric acid produced by the oxidation, the operations are complicated, and adsorbent are expensive. A process for recovering ammonium sulfate from exhaust gases containing less than 3% sulfur dioxide and free oxygen includes contacting the gases at 340-410 C and a space velocity of 1000-8000 with a vanadium pentoxide catalyst. The SO3 formed by the reaction is then treated at 60-250 C in the presence of gaseous ammonia and water vapor in amounts stoichiometric to that required to convert the SO3 to ammonium sulfate, which is removed in the form of crystals.
APTIC-19868

PROCESS OF RECOVERING SULPHUR FROM SULPHIDE MINERALS.

(Patentaktiebolaget Grondal-Ramen, Stockholm
(Sweden)) Brit. Pat. 352,477. 4p., July 6, 1931.
(Appl. April 5, 1930, 7 claims).

Nils Erik Lenander.
Identifiers: *Primary metallurgical processing, *By-product recovery, *So2 removal (combustion products), Sweden, Combustion gases, Coke, Furnaces, Electrostatic precipitators, Sulfur compounds, Sulfides, Catalysis, Reduction.

Sulfur can be recovered from the gases produced by the smelting of pyrite minerals in the form of elementary sulfur by treating the pyrites at 400 C in an enclosed shaft furnace with coke or other suitable solid reducing agents. In the furnace, the greatest part of the sulfur from the pyrites is driven off as gaseous sulfur and the remainder as volatile sulfur compounds. The ascending sulfur dioxide is reduced more or less completely by the coke and also by carbon monoxide. The exit gases are then treated at 350-400 C in a catalyst chamber filled with a metallic oxide catalyst that causes the sulfur compounds to react with one another to form free sulfur which is condensed. The gases are further treated in another chamber to remove the remaining sulfur dioxide. After cooling and condensation, the gases are treated in an electrostatic precipitator for the precipitation of the sulfur condensed.
APTIC-19871

IMPROVEMENTS IN THE PRODUCTION OF SULPHUR.

(Imperial Chemical Industries Ltd., London (England)) Brit. Pat. 358,580. 3p., Oct. 12, 1931. (Appl. July 11, 1930, 5 claims).
Daniel Tyrer.
Identifiers: *By-product recovery, *So2 removal (combustion products), *Reduction, Great britain, Combustion gases, Coal, Coke, Sulfur oxides control, Sulfur compounds, Temperature.

An improved method of reducing sulfur dioxide by coal for the production of sulfur is presented. Sulfurous gas containing no oxygen or an amount insufficient to maintain the reaction temperature is preheated to at least 400-500 C and passed downwardly through a layer of coal at the top of a relatively deep fuel bed. The gaseous products, including those arising from distillation of the fuel, then pass through an intermediate layer of coke, produced by the carbonization of the coal, where the temperature is maintained at 1000-1200 C by the introduction of air from tuyeres. Here the tars are cracked and any residual SO2 is reduced. The resulting gas is withdrawn at a point below that at which the air is introduced.
APTIC-19874

PROCESS OF RECOVERING SULPHUR FROM GASES CONTAINING SULPHUR DIOXIDE.

(Siemens-Lurgi-Cottrell-Elektrofilter G.M.b.H. fuer Forschung und Patentverwertung, Berlin-Siemensstadt (Germany)) Brit. Pat. 439,467. 3p., Dec. 6, 1935. (Appl. June 14, 1935, 5 claims).
Personal Author Not Recorded.
Identifiers: *Dusts, *Electrostatic precipitators, *So2 removal (combustion products), Germany, Combustion gases, By-product recovery, Sulfur oxides control, Reduction, Sulfur compounds.

The efficiency of catalysts used in the recovery of sulfur from sulfur dioxide-containing gases can be impaired by dust particles picked up by the gas in its passage through reduction apparatus containing carbonaceous materials. This drawback is obviated by first ionizing the impurities arising from the reduction process and then precipitating them in an electrical field having a collecting electrode and a nondischarging electrode of the same polarity as the discharge electrodes of the ionizing field. Since the nondischarging electrode is kept free of particles, it is employed as the catalyst surface through which the cleaned gases pass.
APTIC-19875

IMPROVEMENTS IN OR RELATING TO THE CONVERSION OF CARBON DISULPHIDE TO SULPHUR.

(Gas Light and Coke Co., London (England)) Brit. Pat. 449,710. 3p., July 2, 1936. (Appl. April 5, 1935, 9 claims).
Roland Hall Griffith.
Identifiers: *Carbon disulfide, *By-product recovery, *Catalytic oxidation, Great britain, Coal, Cerium compounds, Titanium compounds, Uranium compounds, Vanadium compounds, Sulfur dioxide, Silicon compounds, Sulfur compounds, Catalysis, Catalysts, Gases, Liquids.

In the purification of gases such as coal gas by an oil washing process, considerable quantities of carbon disulfide are obtained as a by-product. The carbon disulfide, which is difficult to handle and transport, can be converted to liquid sulfur by mixing it with SO2 and reacting the mixture at 180-250 C with a titanium, thorium, uranium, cerium, silicon, tungsten, or vanadium catalyst. The catalyst is introduced into the reaction in its oxide form but (with the exception of silicon oxide) is converted to its sulfide form at the commencement of the reaction. A portion of the recovered sulfur can be burned to form further SO2 for use in the process.
APTIC-19876

IMPROVEMENTS RELATING TO THE PREPARATION OF SULPHUR.

(Outokumpu Oy Co., Helsinki (Finland)) Brit. Pat. 1,124,975. 3p., Aug. 21, 1968. (Appl. Jan. 24, 1966, 8 claims).
Personal Author Not Recorded.
Identifiers: *By-product recovery, *Sulfur oxides control, Europe, Primary metallurgical processing, Gasification (synthesis), Sulfur compounds, Catalysts, Reduction.

A three-stage process is described for recovering sulfur from sulfur dioxide-containing gases such as smelter gases or gases evolved from the roasting of sulfur ores and concentrates. In the first stage, gases containing SO2 and free oxygen are reacted at 1000-1200 C with a liquid fuel containing heavy hydrocarbons. Gasification of the oil takes place by partial oxidation; CO, H2, CO2, and H2O are generated. Since the partial oxidation is partly effected by the SO2, elemental sulfur is also produced along with S2, H2S, and COS. Cooling of the gas mixture from the first stage to 400-450 C is followed by catalytical treatment in which CO3, H2, and COS react with SO2 to form S2 and H2S. The gas mixture from this second stage is cooled to 250-280 C and, in a third stage, further catalyzed to remove hydrogen sulfide. The elemental sulfur formed during the process is separated from the gases by condensation. The method requires no additional oxygen for the decomposition of hydrocarbons and permits the heat extracted from the gases between separate stages to be utilized for preheating the gases before the first stage.
APTIC-19877

IMPROVEMENTS IN METHODS OF PRODUCING SULPHUR BY THE REDUCTION OF SULPHUR DIOXIDE.

(Assignee not given.) Brit. Pat. 443,008. 5p., Feb. 19, 1936. (Appl. Oct. 3, 1935, 9 claims).
Axel Rudolf Lindblad.
Identifiers: *By-product recovery, *Reduction, *So2 removal (combustion products), Sweden, Combustion gases, Sulfur oxides control, Sulfur compounds, Catalysts, Temperature.

A method for producing sulfur by the reduction of sulfur dioxide entails introducing a gas mixture containing sulfur dioxide and oxygen through a revolving grate to the bottom of a gas producer. The velocity of the flow of the gases and the temperature in the producer is controlled so that the gases formed consist predominately of sulfur, carbon monoxide, sulfuretted hydrogen, and other reducing gases. While still hot, these gases are brought into contact with an additional amount of sulfur dioxide introduced at the top of the producer, then passed through two or more contact chambers maintained at different temperatures and filled with catalyzers adapted to the temperatures. The use of two or more catalyzers and different temperatures permits the full utilization of the reducing gases. Suitable contact materials are iron hydrates, manganese compounds, titanium compounds, alkali metal compounds, and aluminate cement.
APTIC-19878

TRANSPORT OF LIQUEFIED GASES BY SEA. SPECIALIZED LOW-TEMPERATURE FLEET NOW OF LARGE PROPORTIONS.

J. Refrig., 11 (6):141-142, 144, June 1968. 9 refs.
H. Klay.
Identifiers: *Storage facilities, *Ships, *Compressed gases, Construction materials, Steel, Transportation, Compression, Pressure, Temperature.

Among the liquefied-gas tankers described, one vessel has six cylindrical steel tanks with a total capacity of 3000 cu m of liquid propane or ammonia. Cargo is taken aboard at -50 C from fully refrigerated land tanks or at +45 C from pressure tanks. At sea. cargo temperature is maintained below +10 C by the reliquefaction plant which comprises three single-stage labyrinth compressors. A second vessel, designed for the transport of ethylene, propylene, propane, butane, and ammonia can handle gases down to -104 C without compression or at higher temperatures and pressures up to 5.25 kp/sq cm. The refrigeration unit has two two-stage labyrinth-piston compressors and a closed cooling circuit for the condensation of ethylne. The tanker is equipped with a thermally insulated pressure tank in the form of two parallel cylinders of steel and nickel alloy. A third vessel is fitted with prismatic tanks of carbon steel for a maximum pressure of 0.3 kp/cm. The reliquefaction plant has three motor-driven labyrinth piston compressors.
APTIC-19883

RECOVERY OF SULPHUR.

(Raymond F. Bacon) U. S. Pat. 1,917,234. 5p., July 11, 1933. (Appl. July 29, 1930, 11 claims).
Raymond F. Bacon, and Isaac Bencowitz.
Identifiers: *By-product recovery, *So2 removal (combustion products, *Reduction, Stack gases, Boilers, Fuel gases, Natural gas, Furnaces, Contact processing, Collectors, Electrostatic precipitators, Catalytic oxidation, So2 removal (combustion products), Absorption (general), Sulfur compounds, Hydrogen sulfide, Temperature.

In various processes suggested for recovering elemental sulfur from roaster gases, the sulfur dioxide gases are usually treated at some point removed from their source. This results in loss of the sensible heat of the gases, and the necessity of supplying supplemental heat to replace the lost heat. A process is described for recovering elemental sulfur from SO2 gases in which the high sensible heat of the gases is retained, and additional heat is derived from the furnace itself. The hot gases are first sent to a collector to remove any fine dust entrained in the SO2. The cleaned gases are passed into the reaction chamber where they are contacted with a reducing gas, such as natural gas, water gas, or producer gas. The temperature of the reducing gas is raised when it is mixed with the hot SO2 gases, and by absorption of heat from the burner. The reaction between the SO2 and the reducing gas is rapid and exothermic. As the gases leave the chamber they are cooled in a waste heat boiler, and treated with an electrostatic precipitator or by absorption to remove the sulfur. The residual gases may be catalytically oxidized to remove hydrogen sulfide and recover additional sulfur.
APTIC-19886

TRANSPORTATION OF LIQUEFIED NATURAL GAS BY RAIL AND BY HIGHWAY.

(Transport de gaz naturel liquefie par rail et par route). Text in French. Gaz Aujourd'hui, 92 (9):319-324, Sept. 1968. (Also: Erdoel-Erdgas Z., 83 (12):430-435, Dec. 1967).
G. Stahl.
Identifiers: *Natural gas, *Transportation, *Design criteria, *Compressed gases, Construction materials, Steel, Germany, Trains, Trucks.

The design and fabrication of two transport vehicles for liquefied natural gas is described. One is a railroad tank car and the other is a highway tractor-trailer. In addition to an introductory history and some administrative detail, the design limitations, safety regulations, material specifications, and similar design considerations are discussed. Both carriers utilize an inner tank of 5% nickel austenitic stainless steel which is designed for 95% liquid content and 5% ullage. The outer tank is common boiler plate. The annular space (220-250-mm thick) contains insulation, perlite for the trailer and Hostaflon for the railroad car. The inner tank is attached to the outer longitudinally by tension-compression tie-rods with ball-and-socket joints at both ends. It is supported transversely by a bottom rail and lateral elastic pads. This complex support system is designed to minimize thermal stresses in and loading thermal shock to the internal tank.
APTIC-19887

STRUCTURAL FEASIBILITY STUDY OF PRESSURIZED TANKS FOR LIQUID-METHANE FUELED SUPERSONIC AIRCRAFT.

National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center, TN D-4295, 46p., Dec. 1967. 6 refs.
Rene E. Chambellan, Joseph F. Lubomski, and William A. Bevevino.
Identifiers: *Storage facilities, *Jet aircraft, *Compressed gases, Feasibility studies, Natural gas, Design criteria, Methanes.

Light-weight pressurized tanks for the storage of liquid-methane fuel in the wings of supersonic transport aircraft were evaluated. Three types of tank structures were studied: (1) membrane tanks where the only loads in the tank skin are tensile, (2) modified semimonocoque tanks composed of a framework of rings and stringers covered by a pressure-tight skin, and (3) filametary restrained membrane tanks where the outer skins of either metal or sealed fabric are restrained by wires or threads attached to the opposite skin. A typical wing void space having an approximately rectangular prismoidal shape was assumed as a tank envelope. The various tank designs were compared by the use of two numerical ratios, namely, the volumetric efficiency and tank-weight to contained-fuel-weight ratio. Volumetric efficiency is defined as the ratio of the volume of fuel stored in the tank to the storage void volume into which the tank is fitted. For the designs considered, exclusive of insulation, volumetric efficiencies ranged from 81.1 to 99.6 % and tank-weight to contained-fuel-weight ratios ranged from 0.0241 to 0.0556. No single tank design considered proved to be superior with respect to both volumetric efficiency and the ratio of tank weight to contained fuel weight. For the situation where there is inadequate storage volume for fuel and where it becomes necessary to redesign the airplane, detailed tank designs and aircraft range and payload analyses will be required to determine the proper compromise between tank weight and volumetric efficiency. Based on volumetric efficiency alone, the best design is the tridirectional filamentary restrained membrane tank. This tank is composed of six flat faces restrained by three sets of orthogonally placed internal filaments. When the tank-weight to contained-fuel-weight ratio is the only criterion, then the single-lobe unidirectional filamentary restrained membrane configuration is the best design. This single-lobe tank has two flat opposed faces connected by filaments, and the remaining four sides of the tank are closed by semicylinders. (Author abstract)
APTIC-19888

METHOD OF REMOVAL OF SULFUR DIOXIDE FROM GAS MIXTURES AND AN ACCEPTOR FOR THIS PURPOSE.

(Werkwijze voor het verwijderen van zwaveldioxyde uit gasgemengsels en een acceptor daarvoor). Text in Dutch. (Shell Internationale Res. Co., The Hague) Netherlands Pat. 298, 751. 11p., Aug. 10, 1965. 1 ref. (Appl. Oct. 3, 1963. 21 claims).
Personal Author Not Recorded.
Identifiers: *Adsorption (general), Europe, Combustion gases, Natural gas, Hydrocarbons, Methanes, Antimony compounds, Iron compounds, Aluminum oxides, Reduction, Temperature.

A method of removing sulfur dioxide from gas mixtures is described. An acceptor consists of one or more alkali-metal compounds on a carrier of alpha-Aluminum oxide and contains between 1 and 25 weight % of alkali-metal (s) as well as additions of a) at least 0.01% or b) at least 0.2% of the alkali-metal content, A) of Fe or Fe compounds, or B) of each Fe and Sb or of their respective compounds. The binding of SO2 by the acceptor takes place at a temperature between 150 and 400 C, preferably between 250 and 300 C. The SO2-laden acceptor is regenerated with a reducing gas, preferably a hydrocarbon and, specifically, methane or natural gas, or with a reducing gas mixture containing one or more hydrocarbons, at a temperature between 400 and 700 C, preferably between 600 and 700 C. Removal of SO2 from a gas mixture can be carried out by continuously withdrawing the acceptor from the reaction chamber in which it binds SO2, continuously regenerating it with a reducing gas or gas mixture, and continuously returning the regenerated acceptor to the reaction chamber. The method of preparing the acceptor employs previously known procedures to produce acceptors to the specifications given above. The methods of preparation, the performance oat 270 C, and the results of regeneration at 650 C of five such acceptors of different compositions are given and discussed for illustration.
APTIC-19889

CATALYTIC HYDROGENATION OF ACETYLENE AND NITROGEN OXIDES IN COKE GAS.

(Katalityczne uwodornienie acetylenu oraz tlenkow azotu w gazie koksowniczym). Text in Polish. Przemysl Chem., 48 (2): 85-87, Feb. 1969. 9 refs.
Eugeniusz Slugocki.
Identifiers: *Coke, *Acetylenes, *Nitrogen oxides, *Catalysis, *Hydrogenation, Europe, Aluminum oxides, Catalysts, Flow rates, Gases, Temperature.

The properties of a new Co-Mo catalyst were studied in the process of acetylene selective hydrogenation and simultaneous removal of nitrogen oxides from coke gas. Silica gel and china-clay were used as catalyst carriers (catalyst KCM-7 and GCM-7, respectively). Preparation of the catalyst is described. The catalysts were tested at various temperatures and flow velocities of coke gas. Their activity in the process of both C2H2 and nitrogen oxides hydrogenation was determined by quantitative analysis of the gas before and after the catalyst. The degree of C2H2 hydrogenation was 10 ppm. The best results were obtained between 250-400 deg at the flow velocity of coke gas equal to 5-6 thousands cubic metres/cubic metre hour. The degree of simultaneous hydrogenation of nitrogen oxides was 33-99%, depending on their concentration in the original gas. Thus the catalysts KCM-7 and GCM-7 are much more selective than Pd or Pd-Ru catalysts used so far. Unlike Pd catalyst, Co-Mo catalyst is also resistant to sulfur poisoning.
APTIC-19892

INCINERATOR AIR POLLUTION CONTROL EQUIPMENT.

In: Technical Economic Study of Solid Waste Disposal Needs and Practices. Combustion Engineering, Inc., Windsor, Conn., Product Diversification Dept., Contract PH 86-66-163, Rept. SW-7c, Publ. 1886. 32p., Nov. 1, 1967. 3 refs.
John H. Fernandes.
Identifiers: *Control equipment, *Incineration, Costs, Stack gases, Fly ash, Operating variables, Stacks, Smoke shade, Stack sampling, Collectors, Settling chambers, Electrostatic precipitators, Bag filters, Scrubbers, Water, Pressure, Design criteria.

The performance capability of the major classes of air pollution control equipment including mechanical collectors, wet scrubbers, electrostatic precipitators, fabric collectors, and settling chambers are presented. The relative capital and operating costs, water requirements and pressure drops for different air pollution control systems are also presented, together with design charts for system selection. Air pollution control equipment if properly designed, installed and maintained can meet stringent air pollution regulations. Of first importance to incinerator air pollution control is proper combustion within the burning system. Under these conditions, high efficiency mechanical collectors, wet scrubbers, electrostatic precipitators, and fabric collectors can meet present and projected incinerator air pollution control regulations. However, conventional wet and dry settling chambers will usually not be satisfactory. More knowledge of incinerator pollutants is required, and some application research must be conducted if this equipment is to be applied to incinerators with optimum results. Visual observations are not an accurate means to determine incinerator-stack emissions. Measurement of the pollution control capability of the burning system by sampling of the flue gas is recommended. Although an incinerator stack may appear reasonably clean because of the diluting effect caused by the extremely large quantitites of air usually introduced into the burning system, the fly ash load in the gas may be excessive. Technology is not the limiting factor in controlling air pollution; rather it is the communities' willingness to finance the additional cost for sophisticated air pollution control equipment. It is estimated that present and projected emission levels can usually be obtained for a cost not exceeding 15% of the total plant cost.
APTIC-19896

ON DEDUSTING TECHNIQUE IN PREPARATION PROCESSES.

(Zur Entstaubungstechnik bei Aufbereitungsprozessen). Text in German. Aufbereitungs - Technik, 9 (8):399-409, 1968. 19 refs.
P. Iohn.
Identifiers: *Dusts, *Control equipment, *Design criteria, Germany, Centrifugal separators, Electrostatic precipitators, Settling chambers, Filters, Scrubbers.

In pneumatic removal of dust from coarse material, a dust-laden flow of air is obtained which must be cleaned. If this is not already done by the sifter, separate dust collectors are necessary. The simplest method is to make use of the inertia of the particles by suddenly deflecting the air flow or by enlarging the flow cross section. Settling chambers are based on this principle, too, but they are used only for separation of dust particles larger than 60 micron. By far the majority of dust collectors operate with centrifugal force. A special version of these centrifugal separators consists of a vertical cylindrical chamber with coaxial, smaller dimensioned, cylindrical inlet tube and one or more air inlets for imparting a rotary movement on the air flow. In a second version, the rotary movement is imparted by guide vanes. In yet another version, the air flow enters tangentially in the upper section of the collector and begins to rotate. The rotary movement is accelerated through an annular slot

with guide vanes. In the lower section, auxiliary air is injected. An electrostatic precipitator is described with cylindrical wire mesh collection electrodes. In conclusion, various wet collection methods such as hot water injection and the Permentier collector with a fluidized filter bed and with venturi injection diffusor are described.
APTIC-19897

TRANSPORT OF LIQUEFIED GASES BY SEA. SPECIALIZED LOW TEMPERATURE FLEET NOW OF LARGE PROPORTIONS.

J. Refrig., 11 (5):120-122, May 1968.
H. Klay.
Identifiers: *Compressed gases, *Storage facilities, *Ships, Europe, Natural gas, Operating variables, Transportation, Design criteria, Hydrocarbons, Pressure, Temperature.

The design and operation of tankers for the transport of liquefied gases, i.e., hydrocarbons that can be liquefied by pressure alone are reviewed. Three categories of tankers are considered: pressure tankers with no refrigeration, semi-refrigerated pressure tankers, and fully refrigerated tankers. Small tankers with a cargo capacity of less than 1000 cu m are usually constructed as nonrefrigerated pressure units, the tanks being designed for a saturated vapor pressure corresponding to a boiling point of 45 C. Because of the pressures needed, the tanks must have fairly thick walls. Medium size vessels, i.e. 1000-5000 cu m capacity, are mostly built as semi-refrigerated pressure tankers. Choice of pressure is made so that corresponding temperatures do not call for special low-temperature materials in tank walls. Vessels with a capacity above 5000 cu m are usually fully refrigerated and the pressure in the cargo tanks only 0.05 to 0.3 kp/sq cm above atm. These almost pressureless containers can be prismatic in form, permitting full utilization of cargo space. In all vessels, vapors produced by heat gains are effectively drawn off by labyrinth-piston compressors.
APTIC-19898

THE FUSION TORCH: A NEW APPROACH TO POLLUTION AND ENERGY USAGE.

Preprint, American Institute of Chemical Engineers, New York, N. Y., 29p., 1969. 11 refs. (Presented at the American Institute Chemical Engineers Annual Meeting, 62nd, Washington D. C., Nov. 16-20, 1969.)
Bernard J. Eastlund, and William C. Gough.
Identifiers: *Fusion torch, *Solid waste disposal, Electric power production, Incineration, Design criteria.

Disposal of future large volumes of solid wastes by the Fusion Torch concept, in which ultra-high temperature plasma is used to reduce material to its basic elements, is discussed. The properties of a fusion plasma, which has a temperature of approximately 50 million deg C, and of a future fusion power system based on a deuterium-tritium fuel cycle are reviewed. In such a system, the leakage, as an exhaust, of charged particle energy from the magnetic bottle would be utilized as the fusion torch. The kinetic energy of these 'leakage' charged particles can be converted into electrical energy by various methods: conversion efficiency for the charged particles would be limited to about 50% by thermal cycle considerations. An energy and material balance for processing U. S. municipal wastes in the year 2000 via this concept is developed and compared with such a balance for an advanced incineration system. Air pollution emissions from incineration of the projected quantities of refuse would be acceptable on a worldwide scale, while the fusion torch would release no pollutants to the atmosphere. Although the process has very high energy requirements, if the heat produced in the fusion torch section of the power system is converted to electricity at 50% efficiency, then no additional heat energy would be released to the environment. Unlike incineration, the fusion torch would be anti-entropic, i.e., would concentrate diffused material rather than diffusing the concentrated, and would thus also play a major role in conserving the world's supplies of mineral raw materials.
APTIC-19941

MECHANISM OF CATALYTIC OXIDATION OF SO2 IN A SOLUTION OF MANGANESE SALTS. II. THE EFFECT OF OZONE ON MANGANESE SALT SOLUTIONS.

(Mekhanizm kataliticheskogo okisleniya SO2 v rastvore solei margantsa. II. Deystviye ozona na rastvor zakisnoy soli marganitsa). Text in Russian.
Zh. Fiz. Khim., vol. 6:496-510, 1935.
M. K. Grodzovskiy.
Identifiers: *So2 removal (combustion products), *Catalytic oxidation, *Ozone, Combustion gases, Ussr, Sulfuric acid, Manganese sulfates, Reaction kinetics.

Studies of sulfur dioxide oxidation in manganese salt solutions have led to the following conclusions: SO2 concentrations of 0.3-0.4% do not provide sufficient conversion of Mn-2 to Mn-3 when used as the catalyst in amounts of about 5%; low O2 partial pressure (5-10%) in the flue gases also hampers this conversion, or renders it nonexistent with poor absorption equipment; as acidity increases, alpha O2 decreases to 30-40% sulfuric acid, and the rate of induced oxidation diminishes to zero due to inhibition of complex formation, oxidation, and to a drop in regenerative capability of the catalyst resulting from formation of stable Mn2 (SO4)3; increasing catalyst concentration above 0.025% has no further effect, especially when the oxygen partial pressure is low; increasing the solution volume in itself yields no improvement; negative catalysts poison the manganese; the action of ozone is necessary to counteract the above factors so as to maintain manganese activity; gradually increasing the ozone concentration maintains oxidation and regeneration up to a practical H2SO4 level of 50% (60-65% maximum) even with low SO2 and O2 concentrations; ozone should lead both to accelerated oxidation of MNSO2 and to direct oxidation of Mn-2; these and other effects of ozone form a basis for evaluating the use of ozone to produce concentrated sulfuric acid from flue gases; since SO2 oxidation proceeds by means of Mn oxidation, perhaps more economical means are possible, such as electro-oxidation.
APTIC-19943

THE METHANE PORT OF LE HAVRE.

(Le port methanier du Havre). Text in French.
Centre International de Documentation et d'Etude Petrolieres, Monte Carlo, Monaco, Proc. Congr. Intern., 1st, Petrole Mer, Monte Carlo, Monaco, 1965, p. 305 (1)-305 (6). (May 12-20, paper 305.)
M. Pilloy.
Identifiers: *Compressed gases, *Storage facilities, *Natural gas, France, Transportation, Design criteria, Methanes, Compression, Supercooling.

An account of activities of french administrative units since the discovery of rich sources of natural gas in Algeria in 1954 is followed by a detailed description of the Le Havre Terminal for liquefied natural gas (LNG). Started in 1962, this terminal is designed to: unloading of 770,000 cu m of LNG yearly from 'methane ships' (the first of which, 'Jules Verne', was put into service in early 1965) specially designed for sea transport of LNG; storage of a total of 36,000 cu m of LNG; and regasificiation of the LNG for transport of up to 70,000 cu m hr of natural gas by pipeline to the Paris district. Described are the unloading berth, the storage tanks for LNG, the equipment for regasification of LNG and for recovery of evaporated LNG, the burn-off equipment, and subsidiary equipment, such as pumps for transfer of LNG from one tank to another, for graining the tanks and the various equipments, and for cooling the internal tank walls. Additional installations include an inert-gas generator for flushing out air from the equipments prior to their being put back into service, a storage tank for liquid nitrogen used to maintain a nitrogen atmosphere in the double walls of the LNG tanks, fire-fighting stations with foam-generating equipment, and a control room for automatic remote control of all installations. Four original features of this terminal are discussed at length: maintaining constant absolute pressure in the LNG tanks, use of 9% Ni nickel steel for the internal containers of the LNG tanks, use of polyurethane foam formed in situ for heat insulation of the piping, and a new fire-fighting technique.
APTIC-19944

ENGINE VENT'S CONTRIBUTION TO THE REDUCTION OF AIR POLLUTION.

4p., March 24, 1970.
Personal Author Not Recorded.
Identifiers: *Blowby, *Engine design modification, Engine exhausts, Internal combustion engines, Filters, Settling chambers, Design criteria, Hydrocarbons, Carbon monoxide, Nitrogen oxides, Condensation.

Vehicle exhaust emission tests were performed on two different cars, a 1968 Ford driven 73,167 mi equipped with an Engine Vent with a Volumetric Valve and a 1969 Chevrolet driven 23,763 mi using the manufacturer's standard PCV engine. Test figures are presented for carbon monoxide, hydrocarbon, and nitrogen oxide emissions from engines equipped with Engine Vent and Volumetric Valve, Engine Vent and Spring Loaded Valve, and the PCV valve. The Engine Vent with a Volumetric Valve reduces carbon monoxide and hydrocarbon emissions under all circumstances with respect to engines with varying hours of operation. The Engine Vent unit consists of a head, a condensing chamber, a filter, and a Volumetric Valve designed for the cubic inch displacement of engines. The unit is inserted in a line from the valve cover to the intake manifold at the base of the carburetor. The vacuum created in the intake manifold draws the blowby fumes into the condensing chamber where they are converted to a liquid. The engine heat vaporizes the unburned fuel, water, and light ends of oil. These vapors are then drawn through the filter where they are cleaned before being metered by the Volumetric Valve to the intake manifold. The water, when introduced into the combustion chamber, becomes steam thereby keeping the valves and other parts clean; the light ends of oil act as top cylinder lubrication. The heavy ends, tars, varnish, and lead, remain in the condensing chamber.
APTIC-19948

ELECTROHYDRODYNAMIC SECONDARY FLOW.

Phys. Fluids, 12 (9): 1943-1945, Sept. 1969. 6 refs.
O. E. Ramadan, and S. L. Soo.
Identifiers: *Electric winds, *Electrostatic precipitators, *Mathematical analyses, *Secondary flow, Winds, Flow rates.

Electric winds in electrostatic precipitators are produced by the electrohydrodynamic interaction of space charge of ions and dust particles. As determined by a mathematical analysis of the magnitude of this secondary flow and the factors influencing the magnitude, the electric wind takes the form of jets issuing from the corona wires toward the collecting plate. Depending on the magnitude of the electric Reynolds number of the systems, jet speed may have a peak velocity several times that of the mean flow velocity, usually around 3 m/sec. Velocity is highest at low Reynolds numbers.
APTIC-19952

DESULFURIZATION OF EXHAUST GAS BY ACTIVATED MANGANESE OXIDE.

Karyoku Hatsuden (Thermoelectric Power Generation), 18 (4): 355-360, April 1967.
Translated from Japanese. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services. 17p., Dec. 3, 1969.

R. Hirose, and K. Uno.
Identifiers: *Manganese dioxide (japanese), Japan, Stack gases, By-product recovery, Sulfates, Ammonium compounds.

A method for removing sulfur dioxide from power plant emissions by activated manganese oxide is described. The method involves adding powdered activated manganese oxide to the exhaust gas flow, then oxidizing the gas in a slurry containing ammonia. The manganese oxide can be regenerated, and ammonium sulfate is recovered as a by-product. The advantages of this system include a high SO2 absorption rate; recycling of the manganese oxide; low pressure drop; desirable operating characteristics, and recovery of ammonium sulfate.
APTIC-19959

ON THE SEPARATION CHARACTERISTICS OF COMMERCIAL DRY ELECTROSTATIC PRECIPITATORS.

Staub (English translation from German of: Staub, Reinhaltung Luft), 29 (9):22-29, Sept. 1969. 11 refs.
CFSTI: TT 69-55002/9
Joachim Petroll.
Identifiers: *Electrostatic precipitators, *Separation characteristics, Germany, Dusts, Mathematical analyses, Design criteria.

In general, the exponential formula for monodispersed homogeneous dust is insufficiently accurate for expressing the performance of commercial electroprecipitators. The relationship between the performance and influencing parameters is better shown by the so-called separation characteristic which is obtained from a graph in which the measured performance is plotted in relation to a specific function of the influencing parameters. The influence of factors due to operation and apparatus is shown, as is the influence of measuring errors, on the development of the separation characteristic. The knowledge of this influence has a considerable practical importance for the design of electroprecipitators and also for the assessment of their operation.
APTIC-19968

EXPERIMENTAL REPORT ON THE ELIMINATION OF SULFUROUS ACID GAS BY INJECTION OF LIMESTONE AT MIE POWER STATION. (TEST RESULTS OF LIMESTONE INJECTION AT MIE POWER STATION).

Oct. 25, 1967. Translated from Japanese. Belov and Associates, Denver, Colo., 57p., May 15, 1970.
Personal Author Not Recorded.
Identifiers: *Alkaline additives, *Limestone, Japan, Stack gases, Dusts, Boilers, Fuel oils, Steam plants, Particle size, Iron compounds, Temperature.

The results of a series of tests to determine the ability of limestone powder to remove sulfur dioxide from power plant effluent are discussed. Various conditions, such as making the injection particles as small as possible, using limestone with 1% or more iron content, scattering the powder evenly in the boiler, and placing injection points on the chimney where the temperature is between 1000-1200 C, greatly enhanced the rate of removal. With a ratio of limestone to crude oil of 15% by weight, the removal efficiency is 50-60%. Dust accumulation on the interior walls of the boiler, and especially on the reheat tube, is great. Further work is required to eliminate this problem. (Author abstract modified)
APTIC-19972

UNDERGROUND STORAGE OF LIQUID METHANE.

(Stockage souterrain de methane liquide). Text in French. Compt. Rend. Congr. Ind. Gaz, vol. 78:683-706, 1961. 5 refs.
Jean Toche.
Identifiers: *Methanes, *Compressed gases, *Storage facilities, France, Design criteria, Experimental methods, Mathematical analyses, Heat transfer.

Current research in connection with the underground storage of liquid methane is reviewed. Theoretical calculations, enabling the determination of the heat propagation rate in a permanently or temporarily homogenous terrain, are discussed. The problem of the mechanical stability of a cavity whose walls experience steep temperature gradients is also mentioned. For resonably close numerical application of the theoretical formulae, a knowledge of the mechanical and thermal properties of the rock are needed. The records gave little useful information in this field. Extensive laboratory work was undertaken for the development of new apparatus, and the results of measurements and studies made on samples are given. It was necessary to check by experiment whether the theoretical data permitted extrapolating and the planning of industrial scale cavities with a capacity of tens of thousands of cubic meters. Three experiments are being conducted on cavities with a capacity of about 25 cu m. Results show close agreement with those predicted.
APTIC-19975

EXPERIMENTS WITH DRY PURIFICATION OF DUST-LADEN GASES.

(Experienze su un depuratore a secco di gas polverosi). Text in Italian. Termotecnica (Milan), 23 (1):21-24, 1969. 9 refs. (Presented at the 23rd National Congress of ATI, Balogna, Italy, Sept. 24-28, 1968.)
Paolo Anglesio.
Identifiers: *Dusts, *Centrifugal separators, Italy, Measurement methods, Particle size, Sieve analysis, Screen filters.

An experimental apparatus is described for testing a centrifugal separator, through which is passed environmental air, mixed with dusts of various granulometric sizes, obtained by passing soot from a heating plant through screens. The gravimetric efficiency of the separator was determined experimentally with respect to several classes of particles and in relationship to the pressure drop as the capacity is varied. Various methods of evaluating the dust content of airstreams are discussed. Reasons are given for avoiding whenever possible the use of local content measurement as a means of evaluating the average dust content in the airstream. Gravimetric efficiency is defined as the ratio of the dust captured by the separator to the total dust content in a given volume of dust-laden fluid. It depends on the geometric conditions of the precipitator and those of the stream to be purified; the latter is dependent on the diameter and specific weight of the dust particles, the viscosity, specific gravity, and velocity of the airstream, and the dust content of the air. The use of screens gradually increases in difficulty as grain size becomes smaller; the lower limit is at about 25 micron, which is precisely the size range of most interest for the evaluator. The pressure drop coefficient, used to calculate the pressure drop in the separator, is difficult to determine experimentally, and is more easily approximated by the use of a formula which relates this coefficient to the cross-sectional area of the point of entry and the diameter of the outlet.
APTIC-19977

MEA ABSORBER FOAM PROBLEMS-SOME CAUSES AND CURES.

Oil Gas J., 66 (10):78-79, March 4, 1968.
Allen D. Shell.
Identifiers: *Monoethanolamine, *Foaming, *Absorption, Operating variables, Filters, Amines.

Serious foaming in monoethanolamine (MEA) absorbers can reduce gas throughput by as much as one-half, cause excess solution losses, and require the use of expensive defoamers. The problem may be aggravated by the fact that these defoamers often exhibit side effects in the still, reclaimer, filter, and absorber. Variables affecting foaming in an MEA contactor are closely interrelated and the likelihood that separate causes, whether gas-entrained contaminants or mechanical factors, are additive make it difficult to isolate the effect of any one variable. The correction of serious problems concerning foam and antifoaming agents, therefore, usually requires the establishment of a thoroughly sanitary operation, based on classic design criteria for MEA systems, and the added safety of an activated carbon filter. The filter will keep small residual potential causes of foaming from aggravation by interaction.
APTIC-19978

RATE OF ABSORPTION OF NITROGEN OXIDES IN OPEN TOWERS WITH CENTRIFUGAL VOLUMETRIC SPRAYER.

(Skorost' absorbtsii okislov azota v polykh bashnyakh s tsentrobezhnymi ob'yemnymi raspylitelyami). Text in Russian. Zh. Prikl. Khim., vol. 36:1686-1692, 1963. 1 ref.
S. N. Ganz, and I. Ye. Kusnetsov.
Identifiers: *Spray towers, *Nitrogen oxides, Ussr, Operating variables, Absorption, Sodium carbonate, Flow rates.

Studies made on a pilot absorption tower employing a centrifugal sprayer for the absorption of nitrogen oxides are reported. With a sodium carbonate solution as the absorbing medium, the following optimum operating parameters were established: sprayer rotation rate, 30-35 m/sec; irrigation density, 6-7 cu m/sq m (h); volumetric gas flow rate, 100-150 cu m/cu m (h). Strong dependence of absorption efficiency on hydrodynamic conditions indicates the importance of diffusion drag in the gaseous and liquid phases. It is established that efficiency per unit of reaction volume is 4-5 times greater with this open spray tower than in a packed tower. Reduction in size and hydraulic drag of open towers will provide a 1.5- to 2-fold reduction in capital and operating costs as compared with packed towers.
APTIC-19979

COMPRESSION OF NATURAL GAS.

(Szhizheniye prirodnogo gaza). Text in Russian. Gaz. Prom., vol. 1:19-25, 1956.
Yu. I. Bokserman, and R. P. Polyanskiy.
Identifiers: *Natural gas, *Compression, *Compressed gases, Ussr, Transportation, Vehicles, Design criteria, Methanes.

Industrial compression of natural gas began in the USSR in 1954 at a Moscow plant with a maximum capacity for processing 8650 cu nm of natural gas per hour, yielding 7 cu m of methane per hour. The flow diagram for this installation, which uses a cascade process, is presented and explained. The compressed methane is stored in 3-m diameter, 13-m high steel cylinders enclosed in a reinforced concrete structure. Total storage capacity is 195,000 cu nm, and daily loses due to evaporation are on the order of 2.5% per day. Distribution of the compressed methane is also discussed and development of methane-fueled motor vehicles is mentioned.
APTIC-19980

LIQUEFACTION OF NATURAL GAS.

Cryogenic Eng. News, 3:22-25, March 1968. 24 refs.
W. W. Bodle, and R. C. Proctor.
Identifiers: *Natural gas, *Design criteria, *Compression, *Compressed gases.

The characteristics of the sixteen liquefied natural gas (LNG) plants built since 1964, or now being built, are tabulated. Eleven use cascade refrigeration systems. Four have expander systems. One has a Joule-Thompson system. Natural gas has been the preferred fuel for furnishing energy requirements. Power requirements, both as installed machinery and as return gas quanitities and pressure differentials, are listed. Molecular sieve treatment is favored for acid gas and water

removal; removal of heavy hydrocarbons by coldphase separation is generally used. Specific provisions are generally included for establishing the heating value of LNG produced. (Author abstract)
APTIC-19982

ABOVE-GROUND STORAGE TANKS FOR LIQUEFIED NATURAL GAS.

Preprint, American Society of Mechanical Engineers, New York, 7p., 1966. 1 ref. (Presented at the American Society of Mechanical Engineers Winter Annual Meeting and Energy Systems Exposition, New York, Nov. 27-Dec. 1, 1966, Paper 66WA/PID-4.)
I. L. Wissmiller.
Identifiers: *Storage facilities, *Natural gas, *Compressed gases, Codes, Equipment standards.

The codes and standards governing above-ground storage tanks for liquefied natural gas (LNG) are reviewed. The codes basically outline construction methods and materials and minimum requirements for the protection of persons and property. A detailed description of the largest above-ground tank to date for LNG is given. It is a 300,000-bbl tank under construction in Memphis, Tenn. Details of the foundation, inner and outer tanks, and insulation system are given. (Author abstract modified)
APTIC-19983

NEW DEVELOPMENTS IN LNG CYCLES.

American Gas Association, Inc., New York, Proc. Am. Gas Assoc. Distribution Conf., St. Louis, Mo., 1967, p. 262-266. (May 1-4.)
Frank Wolff, and Claude Salama.
Identifiers: *Natural gas, *Design criteria, *Compression, Canada, Cooling, Compressed gases.

The two-stage expander cycle and the auto-refrigerated cascade cycle for liquefying natural gas are reviewed in detail and illustrated by flow diagrams. As a prime source of refrigeration, the first process uses two-stage expansion of a gas stream that is larger than the quantity of gas liquefied. The refrigeration thus produced is employed to recompress part of the expanded gases to their utilization pressures in distribution mains. Prior to admission to the cold box, feed and refrigeration streams are treated separately in multi-tower molecular sieves to reduce impurities to acceptable levels. In the cold box, the purified natural gas is cooled and partially liquefied. The condensed liquid is separated from the gas in the feed gas separator; the uncondensed feed gas is condensed in the liquefier and subcooled in the subcooler. From this point the subcooled natural gas is split into two streams, one of which is expanded and further cooled in a flash drum. The second stream is expanded into a separate passage of the subcooler, where it vaporizes and thus provides refrigeration to subcool liquefied natural gas. The principle of the refrigeration cascade cycle is that of refrigeration transfer from cooling water to decreasing temperature levels; but the refrigeration consists of a single mixture of a composition such that the partial condensation at any one stage corresponds exactly to the refrigeration requirements at the next stage. The partial condensations of the refrigerant take place at one pressure level, corresponding to the high pressure of the cycle, while the vaporizations occur at a single low pressure corresponding to the cycle compressor suction pressure. Provisions are included for removing impurities from the natural gas.
APTIC-19985

CLEARANCE STANDARDS FOR LNG STORAGE.

American Gas Association, Inc., New York, Proc. Am. Gas Assoc. Operating Section Conf., 1962, 2p. (CEP-62-6.)
H. H. Fitzgerald.
Identifiers: *Methanes, *Compressed gases, *Planning and zoning, *Storage facilities, Natural gas.

Criteria suggested in the 1940's recommend that liquid methane storage plants be isolated from public habitations by a distance of one-half mile. This recommendation would require a plant site of at least one mile square for any new storage plant, thus making LNG storage uneconomical. Today, most gas engineers agree that this recommended isolation distance is ultraconservative, since metallurgical developments have resulted in improved structural material for extreme low temperatures. It is probable that a satisfactory dike can be constructed around an aboveground tank to confine any escaping liquid to the local area of the tank. At the same time, the potential energy of larger storage tanks must be recognized in formulating new guidelines. Information needed to determine the maximum isolation distance required to protect the public includes a knowledge of how far methane gas can be carried on the ground beyond a dike by wind to an external source of ignition and how far from the dike damage can be caused by the radiant heat of flames in the dike.
APTIC-19986

AIR POLLUTION CONTROL IN MUNICIPAL INCINERATION.

J. Air Pollution Control Assoc., 12 (9):414-417, 430, Sept. 1962. 9 refs. (Presented at the Air Pollution Control Association Annual Meeting, 55th, Chicago, Ill., May 20-24, 1962.)
Joseph W. Lenehan.
Identifiers: *Incineration, *Control equipment, Costs, Fly ash, Collectors, Centrifugal separators, Settling chambers, Electrostatic precipitators, Filters, Glass fabrics, Scrubbers, Venturi scrubbers.

The key to successful incinerator planning is the control of air pollution with special emphasis on fly ash collections: without control equipment, a 550 ton per day incinerator will produce 10,000 lb of fly ash per day. The various types of fly ash collectors available are discussed and a table of comparative data is presented for the collectors. Included in the table are the costs of the collectors in $/CFM gas treated, efficiencies, space and water requirements, and gas treatment means. The lowest efficiency is indicated for settling chambers with sprays and the highest efficiencies for venturi scrubbers, glass cloth collectors, and electrostatic precipitators. It is noted that incinerator builders will have to become accustomed to the higher cost and space requirements of fabric filters. The application of these collectors to incinerators will also require greater control of combustion to prevent the formation of sticky soot which binds the filter cloth. The increase of combustibles in refuse and the development of continuous high-temperature indicate a possible field of application for fabric filters in incineration. In connection with electrostatic precipitation, problems of variation in the electrical properties of fly ash can be overcome by adding moisture to gases or combining a precipitator unit with a cyclone collector. The successful use of precipitators in incineration is anticipated.
APTIC-19987

BELOWGROUND STORAGE SYSTEMS FOR LNG.

Preprint, American Society of Mechanical Engineers, New York, 9p., 1966. 6 refs. (Presented at the American Society of Mechanical Engineers Winter Annual Meeting and Energy Systems Exposition, New York, Nov. 27-Dec. 1, 1966, Paper 66WA/PID-5.)
Bert E. Eakin, A. R. Khan, and P. J. Anderson.
Identifiers: *Storage facilities, *Natural gas, *Compressed gases, Concrete, Soils, Design criteria.

The concept of storing cryogenic fluids below ground and the existing designs for frozen in-ground and concrete-tank storage systems are reviewed. The basic design for the storage of liquefied natural gas (LNG) in a lined and insulated quarried cavern is described. The calculation procedures are discussed which have been used to predict the rates of heat influx into these belowground LNG storage containers. The equations, simplifying, assumptions, and heat transfer models which have been used are presented. The differences in the results calculated by the various procedures are discussed. (Author abstract)
APTIC-19988

RECIRCULATION OF MINE VENTILATION SYSTEMS.

Mining Engr. (London), 128 (100):227-234, Jan. 1969. 8 refs. (Presented at the Southern Counties Institute of Mining Engineers, Colloquium on Firedamp Measurement and Control, Isleworth, England, May 3, 1968, Paper 4266.)
S. J. Leach, and A. Slack.
Identifiers: *Fans (blowers), *Mining, Great britain, Dusts, Coal, Ventilation, Methanes, Flow rates.

Problems associated with the recirculation of air in various mine ventilation systems are discussed. Theoretical and experimental work is quoted which shows that recirculation does not cause an increase in the general-body concentration, provided that the fresh-air flow to the region where the recirculating device is operating is not reduced by recirculation. Many situations in which recirculation might be considered are discussed, including headings, coal-face, ripping lips, stable holes, coal cutters. Carefully planned systems involving some recirculation may be very effective in reducing methane and airborne-dust concentrations to an acceptable level, provided certain precautions are taken, notably on starting up the recirculating flow. (Author abstract modified)
APTIC-19995

MAXIMUM GAS CONCENTRATION AT GROUND LEVEL FROM INDUSTRIAL CHIMNEYS.

For primary bibliographic entry see Field 14.
APTIC-19996

IMPROVEMENTS RELATING TO THE RECOVERY OF SULPHUR FROM GAS MIXTURES CONTAINING HYDROCARBONS.

(Anglo-Iranian Oil Co. Ltd., London (England))
Brit. Pat. 689,664. 10p., April 1, 1953. (Appl. April 20, 1951, 13 claims).
John Norman Haresnape, and Kenneth Shephard Cuddington.
Identifiers: *Hydrocarbons, *Hydrogen sulfide, *By-product recovery, *So2 removal (combustion products), Great britain, Stack gases, Natural gas, Contact processing, Petroleum refining, Sulfur compounds, Catalysts, Reduction, Pressure, Temperature.

A process for the recovery of sulfur from gas mixtures containing hydrocarbons is described. This method is well suited for treating natural gas containing hydrogen sulfide, gas streams from oil refining operations containing hydrocarbons, and flue gases containing sulfur dioxide. The process has the advantage that no concentration of the H2S or reduction of the hydrocarbons is necessary. A gas stream containing H2S, SO2, and hydrocarbons is contacted at a temperature of 120-160 C, preferably 150 C, with a bed of alumina or bauxite. This contact material can support the liquid sulfur formed by the reaction between H2S and SO2 in the gas stream. In this way a large surface of the liquid sulfur is exposed to the gas phase, and is continuously removed from the alumina or bauxite bed. The H2S and SO2 are present in the gas stream in the ratio of 2:1 by volume. This process is conducted at atmospheric pressure and at a space velocity of 130-500 v/v/hr.
APTIC-19997

IMPROVED PROCESS FOR PRODUCING SULPHUR.

(Imperial Chemical Industries Ltd., London (England)) Brit. Pat. 350,124. 4p., June 11, 1931. (Appl. April 5, 1930, 4 claims).
Daniel Tyrer.

Identifiers: *Carbon monoxide, *Sulfur compounds, *Oxidation, *By-product recovery, Great britain, Stack gases, Coke, So2 removal (combustion products).

The reduction of sulfur dioxide-containing gases by carbonaceous materials leads not only to the production of elemental sulfur but also to the formation of carbon monoxide and carbon dioxide. This invention provides a means for recovering carbon monoxide in the reaction gases and converting it to heat to be used in maintaining the reaction temperature. Sulfur dioxide gases, preheated to 300-800 C, are contacted at 1000-1300 C with a bed of coke in a retort preferably surrounded by annular combustion flues. Secondary air or gas containing free oxygen is added to the exit gases in amounts less than that equivalent to the carbon monoxide. The mixed gases are then passed through the annular combustion chamber where the carbon monoxide is oxidized, the heat of the combustion serving to maintain the coke bed at the necessary reaction temperature.
APTIC-20000

PROCESS FOR CATALYTICALLY TREATING EXHAUST GASES.

(Monsanto Co., St. Louis, Mo.) U. S. Pat. 3 493 325. 5p., Feb. 3, 1970. 8 refs. (Appl. Sept. 12, 1967, 16 claims).
James F. Roth.
Identifiers: *Engine exhausts, *Internal combustion engines, *Catalytic oxidation, Fuel oils, Gasolines, Kerosene, Automotive emission control, Hydrocarbons, Copper compounds, Oxides, Carbon monoxide, Nitrogen oxides.

A process for the catalytic oxidation of exhaust gases from an internal combustion engine is described. The process involves passing the exhuast, in the absence of secondary air, over a degradative-resistant catalyst which is capable of reducing nitrogen oxides. The exhaust is then passed, in the presence of secondary air, over a catalyst which oxidizes carbon monoxide and hydrocarbons. The recommended catalyst is an alumina supported metal oxide.
APTIC-20281

METHOD AND APPARATUS FOR GAS DECONTAMINATION.

(Assignee not given.) U. S. Pat. 3,498,024. 8p., March 3, 1970. 5 refs. (Appl. March 26, 1968, 10 claims).
Willard R. Calvert Sr.
Identifiers: *Adsorption, *Design criteria, *Carbon dioxide, Screen filters, Nitrogen, Oxygen, Convection, Cooling, Gases, Vapors.

Air purification is important in maintaining the enclosed, independent atmosphere of submarines, space ships, etc. where air is reused through an indefinite time. An air purifying gas separation arrangement which has efficient heat removal during adsorption of gases and vapors is described. The adsorbent bed is held within a housing of suitable structural material. During adsorption, a conduit carries contaminated air under feed pressure to a space beneath a perforate grid which supports the adsorbent bed. As the contaminated air flows upward, through active adsorbent, oxygen, nitrogen, and C-H-O gases are separated from carbon dioxide, moisture, and contaminants which may be present. Gases which precede CO2 in chromatographic sequence emerge from the adsorbent bed, while the CO2, moisture, and other contaminants are retained. A number of heat exchange separators prevent gaseous re-contamination due to accumulation of heat of adsorption, and allow heat transfer to the bed during desorption so that desorbants are rapidly released to disposal.
APTIC-20296

SCOPE OF FUEL OIL DESULFURIZATION FOR JAPANESE REFINERS.

(Juyu datsuryu no genjo to shorai). Text in Japanese. Nenryo Kyokaishi (J. Fuel Soc. Japan, Tokyo), 49 (515):123-130, March 1970.
Kei Tajiri.
Identifiers: *Desulfurization of fuels, Japan, Fuel gases, Fuel oils, Petroleum refining, Operating variables, Design criteria, Costs.

In response to requirements limiting the sulfur content of fuel to 1.7 wt percent, Japanese refineries built topped crude desulfurizers or vacuum gas oil desulfurizers. The refineries are now endeavoring to determine the optimum operating conditions of these desulfurizers to satisfy the more severe sulfur-level requirement which is expected to be set at less than 1.5 percent in the near future. It is noted that no type of desulfurizer can be economically operated at the current price level of fuel oil. Moreover, reducing the sulfur level of fuel oil to less than 1 wt percent will not solve the air pollution problem in densely populated areas where the number of factories burning oil is expected to double. New processes for producing more gaseous fuel must be explored.
APTIC-20299

TWO-STAGE HYDROGENATION OF AN AROMATIC HYDROCARBON FEEDSTOCK CONTAINING DIOLEFINS, MONOOLEFINS AND SULFUR COMPOUNDS.

(Universal Oil Products Co., Des Plaines, Ill.) U. S. Pat. 3,494,859. 6p., Feb. 10, 1970. 5 refs. (Appl. June 7, 1967, 10 claims).
Robin J. Parker.
Identifiers: *Desulfurization of fuels, *Aromatic hydrocarbons, *Hydrogenation, Gasolines, By-product recovery, Olefins, Sulfur compounds, Hydrogen sulfide, Catalysts.

An aromatic hydrocarbon feedstock containing diolefins, monoolefins and sulfur contaminants is hydrogenerated at a relatively low temperature of 200-500 F with a composite catalyst of lithium in palladium-alumina to convert the diolefins to monoolefins. The effluent is separated and an aromatic hydrocarbon is then hydrogenated at a relatively high temperature of 550-750 F with a conventional desulfurization catalyst to saturate olefins and convert sulfur compounds to hydrogen sulfide. Hydrocarbons suitable for gasoline blending and aromatic hydrocarbons suitable for solvent extraction are recovered as separate product streams. The method finds particular utility in stabilizing pyrolysis gasoline. (Author abstract)
APTIC-20304

METHOD AND APPARATUS FOR REMOVING PARTICULATES FROM FLOWING GASES.

(Assignee not given.) U. S. Pat. 3,496,701. 4p., Feb. 24, 1970. 11 refs. (Appl. Dec. 13, 1967, 8 claims).
T. G. Owe Berg.
Identifiers: *Particulates, *Potentiometric methods, *Collectors, *Design criteria, Electrical properties.

Particulates are removed from gases flowing through a duct by concentrating the particulates within a narrow region of the duct and treating the gas flowing in this region. The concentration of the particulates within a narrow region is accomplished by a non-uniform alternating electric field within the duct. In the event that the natural charge on the particulates does not suffice, charging can be effected by means of a corona discharge or any other known device for charging particles. Although a configuration of four electrodes spaced at 90 deg intervals around a duct in conjunction with a transformer and an A. C. source has been shown for generating a non-uniform alternating electric field, it is obvious that other well known arrangements for accomplishing the same result may be used. (Author abstract modified)
APTIC-20308

APPARATUS FOR NITROGEN OXIDES ABSORPTION TO PRODUCE CONCENTRATED NITRIC ACID.

(Chemical Construction Corp., New York, N. Y.) U. S. Pat 3,499,734. 7p., March 10, 1970. 4 refs. (Appl. Jan. 5, 1967, 14 claims).
Daniel J. Newman, and Jorge M. Matta.
Identifiers: *Absorption, *Design criteria, *Nitrogen oxides, Great britain, Packed towers, Nitric acid, Nitric oxide (no), Nitrogen dioxide (no2), Heat transfer.

An apparatus is provided for the absorption of nitrogen oxides from a gas stream into an aqueous absorbent solution to form nitric acid, in which re-oxidation of nitric oxide also takes place. The apparatus is provided with a lower combination heat exchanger-absorber section in which the simultaneous absorption of nitrogen dioxide, re-oxidation of nitric oxide, and cooling of the liquid phase takes place. Two or more heat exchanger sections may be provided in series. A gas-liquid contact section such as a packed section or a plurality of perforated trays is provided above the heat exchanger sections. The feed gas stream containing nitrogen oxides and excess free oxygen is passed into the apparatus below the heat exchanger sections, while the aqueous absorbent solution is admitted above the upper gas-liquid contact section. (Author abstract)
APTIC-20313

DESULFURIZATION OF COKE.

(Tidewater Oil Co., Los Angeles, Calif.) U. S. Pat. 3,472,622. 4p., Oct. 14, 1969. 3 refs. (Appl. Sept. 19, 1966, 7 claims).
Richard D. Ridley.
Identifiers: *Coke, *Desulfurization of fuels, By-product recovery, Sulfur compounds, Hydrogen sulfide, Pressure, Temperature.

A complete process is described for the desulfurization of carbonaceous solids, in particular, fluid coke derived from petroleum residuums. The process involves mixing the raw coke with a finely divided alkali metal sulfide, such as sodium sulfide, and passing hydrogen gas through the mixture at moderate temperatures (1200-1300 F). Sulfur is removed from the coke primarily as hydrogen sulfide, is separated from the unreacted hydrogen, and recovered by conventional means. The reacted coke and sodium sulfide are separated by water washing, the sodium sulfide being water soluble. Spray drying returns the sodium sulfide to its original condition so that it may be recycled. Unlike many known desulfurization processes, this process is preferably carried out at atmospheric pressure; thus, there is no need for costly pressure equipment. The time required to desulfurize the coke by the process varies with the original sulfur content of the coke and the temperature of the reaction. In general, a period of 10 min to three hrs in the kiln is sufficient. Under optimum conditions, adequate desulfurization of a coke containing 6% sulfur can be achieved within one or two hrs at 1200 F. (Author abstract modified)
APTIC-20363

DESULFURIZATION OF PARTICULATE COKE.

(Tidewater Oil Co., Los Angeles, Calif.) U. S. Pat. 3,472,624. 4p., Oct. 14, 1969. 4 refs. (Appl. April 5, 1967, 4 claims).
Richard D. Ridley.
Identifiers: *Coke, *Particulate classifiers, *Desulfurization of fuels, Particle size, Scrubbers, By-product recovery, Hydrogen sulfide, Fractionation.

An effective and economical process for the desulfurization of coke and similar carbonaceous material is described. A supply of fluid coke is first screened to give a minus 60 plus Tyler mesh fraction and a minus 150 plus 200 Tyler mesh fraction. The latter fraction is then impregnated with sodium sulfide and re-screened to minus 150 plus 20 mesh. The two fractions, each containing approximately 6% sulfur, are combined and heated together in a kiln in a hydrogen atmosphere at 1100-1600 F and atmospheric pressure. In some way, the use of carbonaceous material as a carrier for the desulfurizing agent provides for effective desulfurization of the unimpregnated fraction. Under optimum conditions, adequate desulfuriza-

tion is usually achieved within 1 to 2 hrs. After the reaction, the desulfurized fraction is recovered by classification, while the sodium sulfide from the impregnated fraction is reheated and recycled to the kiln.
APTIC-20367

PROCESS FOR DESULFURIZING AND DEODORIZING HYDROCARBONS, ESPECIALLY HYDROCARBON OILS.

(Deutsche Gold- und Silber-Scheideanstalt vormals Roessler (West Germany)) U. S. Pat. 3,496,098. 2p., Feb. 17, 1970. 4 refs. (Appl. Feb. 23, 1967, 5 claims).
Wilfried Rothe.
Identifiers: *Odor counteraction, *Desulfurization of fuels, *Absorption (general), *Catalysts, Carbon black, Graphite, Germany, Fuels, Hydrocarbons, Calcium compounds, Sodium compounds, Organic sulfur compounds, Oxides, Vapors.

Carriers which improve the desulfurizing and deodorizing action of sodium compounds used to treat hydrocarbon vapors are presented. The carriers are mixtures of carbon, preferably graphite, and an alkaline earth metal, preferably calcium oxide; the ratio of oxide to carbon is between 1:0.2 and 1:5 by weight. The carriers are intimately mixed with sodium monoxide or sodium hydride in the form of spheres, cylinders, tablets, and the like by compression molding or extrusion. Because the desulfurizing composition has high heat conductivity, heat accumulations in the reactor bed are avoided and the ability of the alkaline earth metal oxide to absorb sulfur is fully utilized. In addition, the desulfurizing compositions do not sinter during the reaction condition to such an extent that they are impermeable to the hydrocarbon vapors. The hydrocarbons to be purified are passed over the catalysts at 150 to 300 C, whereby all types of organic sulfur compounds are removed.
APTIC-20369

ROUNDUP OF LNG FACILITIES IN THE UNITED STATES.

Pipe Line Ind., vol. 23:39-44, Oct. 1965.
Personal Author Not Recorded.
Identifiers: *Natural gas, *Design criteria, *Compressed gases, *Storage facilities, Construction materials, Costs.

Liquefied natural gas (LNG) storage facilities either built or projected by U. S. gas distributors and transmission companies are enumerated and briefly described. Companies included are: Wisconsin Natural Gas Company, Alabama Gas Works, San Diego Gas and Electric Company, Memphis Light, Gas and Water Div., Philadelphia Gas Works, Transcontinental Gas Pipe Line, Tennessee Gas Transmission, and Texas Eastern Transmission. Liquefaction, storage, and revaporatization capacities are explained; estimated costs are tabulated. Flow diagrams of the processes are included.
APTIC-20448

FEASIBILITY OF ELECTRICAL PRECIPITATION AT HIGH TEMPERATURES AND PRESSURES.

Bureau of Mines, Washington, D. C., Rept. of Investigations 6325, 20p., 1963. 15 refs.
C. C. Shale, W. S. Bowie, J. H. Holden, and G. R. Strimbeck.
Identifiers: *Electrostatic precipitators, *Electrical properties, *Pressure, *Temperature, Fly ash, Coal, Voltage.

The electrical characteristics of air in a 2-in. pipe-type electrostatic precipitator under dynamic conditions at 600-1500 F and 0-80 psig using a negative discharge electrode were studied for potential application to new processes for utilizing coal. These applications include removal of entrained fly ash from the products of combustion from coal-fired boilers to allow direct use of the hot pressurized gases to power a gas turbine, and removal of carbonaceous residue from synthesis gas made from coal in order to permit use of the senible heat in the gas. Results of this one-geometry study show that current-voltage relationships are a function of air pressure and temperature through about 1350 F over the full range of pressure. Corona starting voltage and sparkover voltage vary directly with pressure and inversely with temperature. At temperatures above 1350 F, use of precipitators may be limited to operations at pressures somewhat above atmospheric pressure. Theoretical derivations are presented that relate the effect of gas density on corona starting voltage and the effect of ion mobility on corona current. Deviation from the theory is noted at high current levels. Theoretical discussion is presented to explain the apparent electrical limitations for use of precipitators at high temperature, low gas density, and high corona currents, conditions at which calculated ionic velocities are extremely high. Experimental results are interpreted in terms of the theory presented. At 1500 F, thermal ionization does not appear to be a certain factor. (Author abstract modified)
APTIC-20485

SURVEY OF COMMERCIALLY AVAILABLE CATALYSTS AND SORBENT MATERIALS. (SUMMARY REPORT).

Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., NAPCA Contract PH-86-68-84, Task 13, 305p., July 17, 1969. 9 refs.
R. H. Cherry Jr., D. P. Moon, S. A. Rubin, and R. T. Niehoff.
Identifiers: *Catalysts, *Surface properties, *Sorbents, Absorption, Absorption (general), Data analysis, Costs.

The available information on approximately 360 commercial catalysts, catalyst carriers, and sorbent materials is presented in the form of 26 tabulations in four appendices. The cataloged information on types, properties, usages, and costs (when available) of catalyst materials is intended to indicate which specific materials warrant consideration in a program for the development of sorbents and catalysts for sulfur oxides or nitrogen oxides control. A specially developed Fortran IV catalog log, compatible with a CDC 6400 digital computer, was used to print the information in logically meaningful arrays. The catalog logic and computer algorithm are arranged to permit sorting and classifying of the materials and their properties according to function or type of material as well as composition. Listed physical properties, where available, include: available sizes, available shapes, hardness, crushing strength, pore size, pore volume, surface areas, bulk density, crystallinity, crystallite size, maximum operating temperature, attrition rate, and loss on ignition. In addition to its usefulness as a decision-making tool, this materials survey is useful in its present form for data comparison and storage.
APTIC-20513

INTRODUCTORY PROJECT UNDER CONTRACT WITH THE U. S. A. CONCERNING COOPERATION IN RESEARCH ON DESULFURIZATION OF COMBUSTION GASES.

(Projekt wstepny umowny z USA o wspolpracy w zakresie badan nad odsiarzaniem spalin). Preprint, 9p., 1968 (°). Translated from Polish. Franklin Inst. Research Labs., Philadelphia, Pa. Science Info. Services, 12p.
B. Zubik.
Identifiers: *Desulfurization of fuels, *Research programs, Europe, Boilers, Coal, Fuel additives, Combustion.

The Fuels Department of the Power Metrology Research Organization 'Energopomiar' has the following divisions: Fuels Analysis, Fuels Technology, Research on Air Pollution, and Desulfurization of Combustion Gases. The research theme, 'research into the effect of introducing dolomite into boiler on the disposition of coals to form deposits on the heating surfaces', the objectives of the research, significance of the search, work schedule, time schedule, description of work, deadline, research in experimental and service conditions, the points the research will cover, the number of people and salaries involved, and costs of equipment to be acquired for the three year project are outlined. Specifically, the research will permit wider application of the method of desulfurization of the boiler combustion gases, based on introducing dolomite into the combustion chamber and determining the effect of intermittent or continuous introduction of dolomite into boilers which fire specified kinds of coal.
APTIC-20563

METHOD AND APPARATUS FOR HANDLING ALLERGEN LADEN DUST.

(Assignee not given.) U. S. Pat. 3,489,607. 4p., Jan 13, 1970. 7 refs. (Appl. Oct. 2, 1967, 2 claims).
Earl Babcock.
Identifiers: *Dusts, *Filters, *Vacuum cleaners, Allergies, Operating variables, Design criteria.

To remedy the pollution of air with gaseous allergens while removing dust from a carpet or rug, a method is described in which dust is lifted and delivered to a filter with as little friction as possible. No mechanical agitator is interposed in the flow of the air as it travels from the nozzle to the filter of the vacuum cleaner, and the blower or compressor is on the down-stream side of the filter. Some cooling of the dust is contemplated. To agitate the pile of the rug to loosen the dust, a closed circuit cleaner is used in which the cleaning air is recirculated, while the filtered air is directed into the nozzle through staggered jets. When the nozzle is moved over the rug, the fibers of its pile are blasted and moved back and forth as well as crosswise of the direction of movement without being unduly heated or without beating the particles of dust. Air in the nozzle remains at atmospheric pressure, so the nozzle slides easily over the rug withot being lifted off of the floor. (Author abstract modified)
APTIC-20659

NOXIOUS RESIDUE ELIMINATOR FOR SMELTING PLANT.

(Assignee not given.) U. S. Pat. 3,495,384. 3p., Feb. 17, 1970. 10 refs. (Appl. June 24, 1968, 2 claims).
Howard Alliger.
Identifiers: *Primary metallurgical processing, *Control equipment, *Particle growth, *Ultrasonic whistles, Stack gases, Soot, Stacks, [illegible], Design criteria, Water.

A method for eliminating substantially all the soot and noxious gases, e.g. sulfur dioxide, from large smelter smokestacks is presented which provides for the convenient exhausting of the clean air and gas to the atmosphere. A battery of spray nozzles equipped with ultrasonic resonators or whistles are mounted in a stack to deliver a finely divided mist and ultrasonic vibrations to the gases to be cleaned. The whistles cause the soot particles to grow in size and to become sticky, thereby reducing the amount of water required for their removal. Another battery of ultrasonic whistles are mounted above the nozzles for imparting a furious turbulence to the already whirling gases to cause soot gases, and water to mix. At the top of the smokestack, water headers cascade water down along screens, de-misting the gases and allowing clean air to pass out through the screens.
APTIC-20695

AIR POLLUTION PROBLEMS FACED BY THE IRON AND STEEL INDUSTRY.

Plant Eng., 24 (9):60-63, April 30, 1970.
G. J. Celenza.
Identifiers: *Steel, *Primary metallurgical processing, *Control equipment, Stack gases, Dusts, Fumes, Smokes, Basic oxygen furnaces, Bessemer converters, Blast furnaces, Open hearth

furnaces, Sintering, Centrifugal separators, Electrostatic precipitators, Fans (blowers), Bag filters, Scrubbers, Venturi scrubbers, Ventilation.

Solutions to the air pollution problems in the iron and steel industry are discussed. The steel producing process involves a number of steps with potentially troublesome exhaust emissions. Coke and sinter operations, which produce raw materials for the blast furnace, contribute to the overall plant pollution problem. Coke ovens emit smoke, dust, and combustion products. These contaminants can be lessened by isolating or enclosing storage areas, using dust control devices, and employing proper operating techniques. The dust emissions from sintering facilities can be controlled by using cyclone separators as primary cleaners and electrostatic precipitators as secondary cleaners. By employing a dust catcher, wet scrubber, and electrostatic precipitator, 96% of the dust from the blast furnace can be eliminated. Pollution control equipment for the refining furnances includes electrostatic precipitators, high energy scrubbers, and bag filters. The specific advantages and limitations of each of these devices are discussed.
APTIC-20699

METHOD FOR THE CONVERSION OF HYDROCARBONS.

(Universal Oil Products Co., Des Plaines, Ill.) U. S. Pat. 3,475,324. 6p., Oct. 28, 1969. 4 refs. (Appl. March 8, 1967, 9 claims).
William B. Borst Jr.
Identifiers: *Sulfur oxides control, *Hydrocarbons, *Hydrogenation, Quenching, Catalytic activity, Temperature.

A method for hydrocracking relatively high boiling hydrocarbons (1100 F) is described. Feed hydrocarbons are introduced into a catalytic reaction zone maintained under conversion conditions including the presence of hydrogen gas. The reactor effluent is quenched with a specific vaporous stream which had been previously separated from the reaction zone effluent. The amount of vapor quench is responsive to the measurement of the temperature of the vapor stream out of the high pressure separator such that a predetermined temperature (below about 775 F) is maintained in the vapor stream. Hydrocarbon products of reduced sulfur content are subsequently recovered. (Author abstract modified)
APTIC-20781

HIGH-EFFICIENCY DUST COLLECTING FOR LIGHTWEIGHT AGGREGATE PRODUCTION.

Rock Prod., 73 (6):56-59, June 1970.
A. McElrath Jr.
Identifiers: *Dusts, *Control equipment, Particulates, Industrial emission sources, Operating variables, Particle shape, Particle size, Electrostatic precipitators, Bag filters, Glass fabrics, Scrubbers, Design criteria.

The sources of dust pollution in lightweight aggregate plants can be divided into three broad categories: (1) raw feed preparation; (2) burning process; and (3) product handling. Dust from the burning process is a mixture of burned and unburned feed. This variation can be a source of trouble in the collection process. Disposition of collected dust should be economically beneficial. The three main types of dust collectors are electrostatic precipitators, scrubbers, and glass bag collectors. A comparison of capital cost requirements for each of the three types is different because the cost varies with plant requirements and conditions. Ductwork design is an intergral part of the system. Design and operating characteristics for the three types of collectors are reviewed.
APTIC-21001

RECOVERY OF SULPHUR FROM ROASTER GASES.

(Assignee Not Given.) Brit. Pan. 7, 1932. (Appl. Jan. 12, 1931, 3 claims).
Raymond Foss Bacon.
Identifiers: *Sulfur compounds, *By-product recovery, *So2, Mineral products, Combustion gases, Coal, Coke, Mineral processing, Baffles, So2 removal (combustion products), Oxidation, Heat transfer.

This invention provides a means of enriching with sulfur dioxide the gases evolved from the roasting of pyrite ores or other sulfide minerals, thereby making the recovery of elemental sulfur from roaster gases economically feasible. The method comprises preheating air entering the roasting retort to 300-600 C, as well as equipping the retort with longitudinal baffle plates which carry finely divided sulfur material up the side of the retort and shower it down through the heated air. Preheating permits the oxidation reaction to begin immediately upon the entrance of the air into the retort. The sulfur-enriched gases leaving the retort are then passed to a reduction furnace supplied with suitable reducing material, e.g., coke or coal. Hot gases produced in the reduction step are withdrawn through any suitable heat-exchange apparatus and utilized for preheating the air.
APTIC-22001

PROCESS FOR RECOVERING ELEMENTAL SULFUR FROM SULFUR-GASES.

(Assignee Not Given.) U. S. Pat. 1,140,310. 4p., May 18, 1915. (Appl. June 21, 1913, 6 claims).
William Francis Lamoreaux, and Charles William Renwick.
Identifiers: *Reduction, *So2 removal (combustion products), Coke, Sulfur compounds, Voltage, Temperature, Combustion gases.

A process for reducing sulfur dioxide gases to elemental sulfur is described. When SO2 is passed through an incandescent layer of coke, it is reduced to elemental sulfur, but for the reaction to occur rapidly and completely, the coke layer must be maintained at a high temperature. The higher the temperature, the more rapid will be the formation of elemental sulfur. It was also found that the amount of sulfur formed increases in proportion to the length of time in which the gases are contacted with the carbon. The combustion of carbon in the presence of SO2 will not produce the required temperature for the reduction reaction, and to compensate for this deficiency, an electric current is passed through a mass of heated carbon particles. By properly regulating the amount of electric current, any degree of temperature can be maintained, thus allowing the reaction to run to completion.
APTIC-22002

ABSORPTION OF SULFUR DIOXIDE BY AN AMMONIUM SULFITE-BISULFITE SOLUTION IN AN IRRIGATED VENTURI TUBE.

(Absorbtsiya sernistogo angidrida rastvorom sul'fit-bisulfita ammoniya v oroshayamoy trubke Venturi). Text in Russian. Khim. Prom. (Moscow), 43 (2):132-136, 1967. 4 refs.
B. P. Volgin, T. F. Efimova, and M. S. Gofman.
Identifiers: *Venturi scrubbers, *Absorption (general), Ussr, Packed towers, Ammonium compounds, Sulfites, Flow rates, Combustion gases.

Scale model studies of the absorption of sulfur dioxide (initial concentration 0.14-18%, flow rate 25-60 m/sec) by ammonium sulfite-bisulfite solution (specific flow rate 10-15 liters/cu m) in a venturi scrubber are reported. Two throat geometries were used: rectangular, 10 by 15 mm and 13 mm long; circular, 20 mm diameter by 10 mm long. It is estimated that the venturi scrubber is 60 times more efficient than a packed tower scrubber, even though its flow resistance is 38% higher.
APTIC-22003

METHOD FOR REDUCING SULPHUR DIOXIDE.

(General Chemical Co., New York.) U. S. Pat. 2,043,202. 5p., June 2, 1936. (Appl. July 23, 1932, 12 claims).
Henry F. Merriam.
Identifiers: *Reduction, *So2 removal (combustion products), Design criteria, Sulfur compounds, Catalysts, Temperature, Combustion gases.

A method for reducing concentrated sulfur dioxide to elemental sulfur is described. The gas mixture, containing reacting proportions of SO2 and reducing agents is passed over a catalyst, such as bauxite. The reduction of SO2 to sulfur is an exothermic reaction, generating large quantities of heat. In such reactions, when the temperature rises excessively, hydrogen sulfide tends to form, thus reducing the amount of sulfur recovered. The temperature can be maintained at 650 C or below by circulating controlled amounts of reaction products through the reaction zone. This dilutes the entering gas stream and minimizes H2S formation. The device used in this process is described in detail.
APTIC-22004

CHIMNEYS AND THE DISPERSAL OF SMOKE.

For primary bibliographic entry see Field 14.
APTIC-22006

OXIDATION OF AMMONIUM SULPHITE SOLUTION.

Bureau of Mines, Washington, D. C., Rept. of Investigation 3339, p. 47-51, May 1937.
Frank S. Wartman.
Identifiers: *So2 removal (combustion products), *Ammonium compounds, *Sulfites, *Oxidation, Stack gases, Scrubbers, Sulfur compounds, Sulfates, Reaction kinetics.

By washing flue gases countercurrently in an ammonium sulfite solution, a large amount of sulfur dioxide can be removed, yielding an ammonium bisulfite solution which in turn can be reheated to produce pure SO2 and a reusable ammonium sulfite solution. The drawback of this SO2 removal process is that when oxygen in air comes into contact with ammonium sulfite solution, the resulting oxidation process produces a precipitation of ammonium sulfate which is an economic cost rather than a benefit. Thus the inhibition of this oxidation process is of great commercial interest. Various rates of oxidation were determined experimentally for ammonium sulfite solutions, and the rate of oxidation in general was limited by the rate at which the solution will absorb oxygen; the nature of contact between air and the solution has a definite bearing on the oxidation process. For bisulfite solutions, the limiting factor is the rate at which dissolved oxygen will react with the dissolved salt. Various inhibitors were tested under a static condition, and the tabulated results show that gallic acid, tannic acid, catechol, pyrogallol, metol and hydroquinon all have strong effects on oxidation. Their effectiveness under dynamic conditions, however, is yet to be determined.
APTIC-22007

IMPROVEMENTS IN OR RELATING TO APPARATUS FOR THE REDUCTION OF SULPHUR DIOXIDE TO ELEMENTAL SULPHUR.

(Assignee not given.) Brit. Pat. 421,290. 6p., Dec. 18, 1934. (Appl. June 21, 1933, 12 claims).
Sibley Byron McCluskey.
Identifiers: *So2 removal (combustion products), *Reduction, Carbon black, Combustion gases, By-product recovery, Design criteria.

An apparatus for the reduction of sulfur dioxide to elemental sulfur is presented, with particular reference to furnaces for effecting reduction of the SO2 content of gaseous mixtures with or without reducing gases. An excess of the reducing agent was required in previous inventions, involving the expenditure of uneconomic amounts of fuel, and the further disadvantage that it was not possible to exercise any regulated control to effect the reduction of some desired proportion of the SO2. The combustion zone in which the reduction is effected comprises a chamber through which the

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gas is passed over a hot bed of solid carbonaceous material disposed on a chain grate. One or more mechanical feeders are arranged above the combustion chamber, each feeder being provided with a device to permit independent adjustment of the rate at which the fuel is fed from there on to the grate. A gas-tight feed gate permits the fuel charge to be fed when and as desired on to the chain grate while preventing the escape of gas. The fuel charge from the first mechanical feeder is fed through a feed aperture in a low arch, constructed above the first portion of the chain grate, into an initial fuel feed chamber which is isolated from the main combustion chamber by the low arch and a distributing bridge. The distribution bridge, which is constructed of durable refractory material and/or provided with water-cooling devices so as to render it resistant to the corrosive action of the hot gases as well as the abrasive action of the passing fuel, serves to effect the even distribution of the fuel on the chain grate and to maintain a fuel bed of substantially uniform depth. The reducing gases may be any of the commercial mixtures such as water-gas, producer-gas, blue-gas, blast-furnace-gas, coke-oven-gas, or natural gas.
APTIC-22008

METHOD OF RECOVERING SULPHUR.

(General Chemical Co., New York) U. S. Pat. 1,771,480. 7p., July 29, 1930. (Appl. March 2, 1926, 24 claims).
Raymond C. Benner, and Alfred Paul Thompson.
Identifiers: *So2 removal (combustion products), *Reduction, Combustion gases, Coal, Coke, By-product recovery, Hydrocarbons, Carbon monoxide, Oxygen, Hydrogen sulfide, Catalysts, Oxidation, Temperature.

A method for reducing sulfur dioxide to elemental sulfur is described. The SO2-containing gas is admitted at the top of a reduction chamber, and bituminous coal is continuously fed in through a feed mechanism. Sufficient air is introduced to oxidize some of the combustible matter to maintain the required 700-800 C temperature. As the coal enters, a sudden partial coking occurs, liberating large amounts of hydrocarbons and free hydrogen. As the SO2 enters, it encounters a strongly reducing atmosphere consisting of solid carbon particles, hydrocarbons, and free hydrogen, and its reduction begins. The gaseous products pass downward through the hot coke bed where tar and soot are driven off and the reduction reaction continues. After the gaseous products are removed from the coke bed, SO2 gas is added to the mixture to provide sufficient reducible gas to react with the reducing gases, hydrogen sulfide and carbon monoxide, which are present. The resulting mixture is passed over a bauxite catalyst. The temperature of the catalyst should be above that at which the elemental sulfur formed will condense and be retained, and below that where interaction of sulfur and water vapor occurs to form SO2 and H2S.
APTIC-22012

RECOVERY OF ELEMENTAL SULPHUR.

(Guggenheim Brothers, New York) U. S. Pat. 1,972,883. 7p., Sept. 11, 1934. (Appl. March 31, 1932, 14 claims).
George H. Gleason, and Alfred C. Loonam.
Identifiers: *So2 removal (combustion products), *Reduction, Combustion gases, Scrubbers, By-product recovery, Absorption (general), Sulfur compounds, Condensation, Heat transfer.

A method of recovering elemental sulfur from sulfur dioxide-containing gases is described. Different methods of reducing SO2 to recover elemental sulfur have had several difficulties, including the lack of a cheap, compact, and cyclic process for concentrating the SO2, difficulty in recovering the sulfur from the gaseous product, and impure sulfur products. In this method, the SO2 in the gas is concentrated by absorption in a suitable medium, then followed by heating to release the concentrated SO2 and regenerate the absorbing medium. The SO2 is reduced by hot carbonaceous material to form elemental sulfur vapor. The gaseous reduction product is then scrubbed to remove any objectionable or deleterious contaminants. The sulfur vapor is condensed to molten sulfur, and the heat dissipated in the condensation process is used to liberate the concentrated SO2 from the absorbing medium. By employing this process, a liquid or molten product is obtained at such a temperature that it is not oxidized or subject of loss by vaporization.
APTIC-22013

IMPROVEMENTS IN THE PRODUCTION OF SULPHUR FROM SULPHUR DIOXIDE.

(Imperial Chemicals Industries, Ltd., London (England)) Brit. Pat. 357,178. 5p., Sept. 16, 1931. (Appl. June 1[illegible], 1930, 7 claims).
Daniel Tyrer.
Identifiers: *By-product recovery, *Sulfur compounds, Great britain, Coal, Coke, So2 removal (combustion products), Combustion gases, Reduction.

This invention relates to the production of sulfur from sulfur dioxide by the reduction of the latter at 600-800 C with semi-coke that is carbonized from raw coal as the result of direct contact between the coal and the sulfurous gases. Contamination of the gases by tar vapors arising during distillation of coal is avoided by passing the gases and vapors through the lower layer of semi-coke, heated to about 1000 C, where the vapors decompose to leave the gases in a suitable condition for the recovery of sulfur. In one form of the invention, the process is carried out in a pair of vertical retorts. Initially, both are partly charged with semi-coke and the charge completed by feeding raw coal over the semi-coke. Both retorts are then raised to red heat by an air blast, after which a mixture of sulfur dioxide and air is fed to the base of the one retort. The air is supplied in an amount sufficient to cause the heat evolved in the combustion of the semi-coke to compensate for the heat absorbed in reduction. The resulting gases are passed upwardly through the layer of coal in one retort and downwardly through the layer of coal in the second retort, then through the lower layer of semi-coke in the second retort.
APTIC-22014

FIBROUS DUST-ITS MEASUREMENT AND CONTROL.

For primary bibliographic entry see Field 03.
APTIC-22017

MOTOR VEHICLES AND AIR POLLTUION.

(Jidosha to taiki osen). Text in Japanese. Nippon Kikai Gakkai-shi (Journal of the Japanese Society of Mechanical Engineers) (Tokyo), 73 (618):990-999, July 5, 1970. 20 refs.
Keitaro Nakajima, and Yoshio Yamanaka.
Identifiers: *Automotive emissions, *Automotive emission control, Emission standards, Japan, Oxidants, Smog, Automobiles, Fuel additives, Hydrocarbons, Carbon monoxide, Nitrogen oxides.

The present status of air pollution and the fundamental attitudes toward its control in the U. S., Europe, and Japan are presented. Japan is second only to the U. S. in public concern toward air pollution problems, and control measures were initiated at the same time as in California. The carbon monoxide density has been slowly increasing, reflecting the rapid change in Japanese society with respect to the traffic volume, the movement of vehicles, and the urban structure. Automobile emissions, however, are being controlled, and the future decrease of CO density in cities is anticipated. A comparison of pollutant density for CO, NO2, SO[illegible], and hydrocarbons in Tokyo and some U. S, cities is given. An investigation is urgently needed in Japan in order to determine if photochemical smog exists, and if so, whether it can be reduced by the control of HC or NOx from automobiles. Emission standards and control techniques in the U. S and Europe are given, and are compared to the standard in Japan where the requirement is that the concentration of CO must be less than 2.5% by the 4-mode simulation test. In Japan, at present greater efforts are being expended in the quality control of the automobile manufacturing process than in the designing of preventative measures. Various control measures under development in the U. S. such as the Transmission Controlled Spark system by GM are introduced and future projections as to the pollution conditions are given.
APTIC-22022

HYDRODESULFURIZATION OF KHAFJI RESIDUAL OIL.

Bull. Japan Petrol. Inst., vol. 12:10-15, May 1970. 7 refs.
Yoshikazu Shimizu, Keiichi Inoue, Hiroyuki Nishikata, Yutaka Koenuma, and Yasuhiro Takemura.
Identifiers: *Residual oils, *Hydrodesulfurization, Japan, Reaction kinetics.

Kinetic equations are derived for catalytic hydrodesulfurization of fuel oil in a trickling packed bed reactor, taking into account the rates of hydrogen dissolution into oil, diffusion in pores, and intrinsic chemical reactions. Experiments under the conditions of 370-420 C and 51-131 atm in absolute pressure indicate that the desulfurization reaction of the Khafji residual oil is second order with respect to sulfur concentration in oil. The effect of total pressure on reaction rate is also examined. (Author abstract modified)
APTIC-22023

PLEATED GAS FILTER

(Wehr Corp., Milwaukee Wisc.) U. S. Pat. 3,505,795. 6p., April 14, 1970. 12 refs. (Appl. April 26, 1968, 6 claims).
Oscar A. Wurtenberg.
Identifiers: *Filters, Dusts, Design criteria.

An improved high-efficiency low-resistance type of filter for removing dust and other particulate matter from gas streams is described. H consists of a rectangular frame in which an expendable pleated filter element is detachably secured, with the effective filtering surface of the element being enlarged by incorporating deep central pockets and shallow end pockets in the element as it is assembled. The confining structure of the filter element effects the shaping of the filter pockets during passage of gas through the filter. This filter exhibits advantages over previous ones in that it has a large filtering surface for a given area, and because the pocket type construction reduces the billowing effect when being subjected to pressure.
APTIC-22024

SELECTIVE REMOVAL OF NITROGEN DIOXIDE AND/OR OXYGEN FROM GAS MIXTURES CONTAINING NITRIC OXIDE.

(Badische Anilin- and Soda-Fabrik A. G., Ludwigshafen (West Germany)) U. S. Pat. 3,512,925. 4p., May 19, 1970. 1 ref. (Appl. July 12, 1967, 8 claims).
Guenter Buechler, Heinz Engelbach, and Heinz Theobald.
Identifiers: *Nitrogen dioxide (no2), *Oxygen, *Reduction, Germany, Control methods, Hydrogen, Iron compounds, Manganese compounds, Silver compounds, Nitric oxide (no), Catalysis, Gases.

A process for the selective removal of nitrogen dioxide and/or molecular oxygen from gas mixtures containing nitric oxide is described. The method involves the catalytic reduction of NO2 and 02 in gas mixtures containing NO with hydrogen as the reducing agent. Using hydrogen as the reducing agent has the advantage that there is no formation of carbon dioxide or carbon monoxide by which the NO would be contaminated. The

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catalyst used is one which contains silver as the active component, and, if desired, manganese or iron, particularly in the form of their oxidic compounds. The catalysts can be used alone, or in combination with a carrier material, such as aluminum oxide, silicon dioxide, or diatomaceous earth. The process is carried out at a temperature between 100 and 600 C at atmospheric pressure.
APTIC-22025

INSTALLATION OF INERTIAL DUST FILTER ON AIRPORT RUNWAY AND/OR STREET CLEANING EQUIPMENT.

(U. S. Secretary of the Air Force) U. S. Pat. 3,505,703. 9p., April 14, 1970. 5 refs. (Appl. May 15, 1968, 3 claims).
Roger A. Miller, and Edward S. Issenmann.
Identifiers: *Dusts, *Centrifugal separators, *Filters, Airports, Streets, Design criteria.

An inertial dust filter for use on airport runways and similar surfaces is described. The device is a mobile power operated vacuum surface cleaner, which eliminates bags as a storage means. The use of bags requires periodic replacement and cleaning; they are bulky, expensive, and easily damaged; and they cannot be used in wet or damp weather. The device described includes means for separating any of the heavier or larger debris sucked in from the rest, and employs centrifugal separation within a closed low pressure chamber for separating dust from the input stream without the use of moving parts or bags. Dust and debris are collected in a closed chamber located under the low pressure chamber.
APTIC-22026

VAPOR RECOVERY SYSTEM.

(Atlantic Richfield Co., Phila., Pa.) U. S. Pat. 3,515,108. 6p., June 2, 1970. 6 refs. (Appl. Dec. 2, 1968, 4 claims).
Wendell F. Deeter, and Harold D. Daigh.
Identifiers: *Vapor recovery systems, *Automotive emission control, Fuel evaporation, Internal combustion engines, Adsorption, Design criteria, Hydrocarbons.

A vapor recovery system for reducing evaporative emissions from vehicles with internal combustion engines is described. The system includes a condenser in which vapors from the fuel tank and carburetor bowl are partially condensed and the condensate returned to the fuel tank. Vapors containing uncondensed hydrocarbons are directed into a carbon trap where the hydrocarbons are adsorbed before emission into the atmosphere. Fresh air is drawn through the absorbent material during operation of the vehicle above a predetermined level of delivered power to desorb hydrocarbons from it. The primary advantage of this method over previous ones is that the desorbed hydrocarbons are only allowed to enter the air/fuel mixture at periods when the performance will not suffer from it, particularly not at low speeds or idle.
APTIC-22027

ROLE OF NATURAL GAS IN THE STRUGGLE AGAINST AIR POLLUTION.

(Die Rolle des Erdgases im Kampf gefen die Luftverunreinigung). Text in German. Gas, Wasser, Waerme, 24(6):124-129, 1970. (Presented to the International Colloquium On Marketing of Gas.)
Personal Author Not Recorded.
Identifiers: *Natural gas, *Public information, Control agencies, Legislation, Plant damage, Epidemiology, Materials deterioration, Germany, Industrial emission sources.

A general review of the present knowledge on the contributions to air pollution by domestic heating (at least 50% in Paris), industrial processes (20 to 25%), and motor vehicles (25%), is followed by a description of the effects of polluted air on humans, plants, and building materials. Less known effects on humans are: general physiological debilitation and increased irritability resulting in an about 15% loss of labor productivity, as well as a decrease in the amount of red corpuscles in the blood. An informative review of the existing legislation and administrative bodies created to combat air pollution in Belgium, France, Great Britain, Italy, Holland, West Germany, and the U S A, is accompanied by a discussion of their effectiveness. A crusade for clean air through the use of natural gas is outlined, which includes wide publicity of advantages with its use and educational campaigns directed toward administrators at different hierarchaical levels.
APTIC-22031

ORIENTATION AND ADHESION OF PARTICLES.

IEEE (Inst. Elec. Electron. Engrs.) Trans. Ind. Electron. Control Instrum., 12 (2):46-50, Nov. 1965. 3 refs.
J. M. Niedra, and G. W. Penney.
Identifiers: *Adhesion, *Dusts, Deposition, Electrostatic precipitators, Electrical properties.

From an investigation of the conditions under which good adhesion can be obtained, it appears that fine dust particles, if deposited as single particles, can rotate slightly as they approach the previously deposited particles so that negative areas tend to contact positive areas. In order to bring the former dipole hypothesis of adhesion in agreement with experiment, a modified hypothesis is proposed which assumes that the surfaces of particles as small as 10 micron may be covered by numerous positive and negative areas. Adhesive forces are attributed to electrostatic attraction between small areas of opposite polarity brought together at the points of interparticle contact. Higher humidities appear to increase the intrinsic adhesive properties of particles in both mechanically deposited and electrically precipitated dusts. However, if the high humidity exists during electrical precipitation of high resistivity dust, the increased interparticle forces may be overbalanced by a looser packing of the particles brought about by the reduction in resistivity. (Author conclusions modified)
APTIC-22034

PROCESS FOR THE ELECTROPHORETIC PREPARATION OF CORROSION RESISTANT COATINGS.

(Stollack A. G., Guntramsdorf (Austria)) U. S. Pat. 3,513,083. 2p., May 19, 1970. 2 refs. (Appl. June 27, 1967, 8 claims).
Robert Vitek.
Identifiers: *Corrosion, *Surface coatings, *Control methods, Europe.

A process for the electrophoretic preparation of corrosion resistant coatings is described. The process consists of dipping the item to be coated, such as a car body, into aqueous electrophoretic baths comprised of pigments, water-soluble resins of polyester resins and formaldehyde condensation resins, and small amounts of a silicone-resin. The parameters of the actual coating operation are given, and a background of the coating material is included. Salt-spray tests indicate that the method described is 2.5-3 times more resistant than previous ones. The increase in corrosion resistance is based on the fact that the silicone resins make the synthetic lacquer resins hydrophobic.
APTIC-22036

CARBONATION PROCESS FOR SO2 REMOVAL.

(Ionics, Inc., Watertown, Mass.) U. S. Pat. 3,515,513. 7p., June 2, 1970. 6 refs. (Appl. Feb. 3, 1969, 5 claims).
Edgardo J. Parsi.
Identifiers: *Absorption (general), Combustion gases, Carbon dioxide, Sulfates, Electrolysis.

A carbonation process for sulfur dioxide removal is described. The method is directed to increasing the current efficiency of the cation exchange membrane located next to the cathode in a three chamber cell for the electrolytic conversion of an alkali metal sulfate for use in the removal and recovery of the contaminants, carbon dioxide is introduced into the cell's catholyte solution by contacting the solution with a portion of flue gas at any point in the catholyte system, preferably by recycling the catholyte solution between the cell's cathode compartment and carbonation tower. Due to the design of this system, a more efficient electrolytic conversion than previous ones is affected.
APTIC-22038

PROCESS FOR ABSORPTION OF UNDESIRABLE GASEOUS EFFLUENTS.

(Phelps Dodge Corp., New York) U. S. Pat. 3,514,283. 7p., May 26, 1970. 4 refs. (Appl. Jan. 30, 1968, 5 claims).
William A. Griffith.
Identifiers: *Absorption, *Absorption (general), Combustion gases, Primary metallurgical processing, Hydrochloric acid, Carbon monoxide, Nitrogen dioxide (no2), Hydrogen sulfide.

A process for the absorption of acidic gaseous effluents produced during the treatment of ores is described. Some of the pollutants which can be treated with this system are hydrogen sulfide, sulfur dioxide, hydrogen chloride, carbon dioxide, and nitrogen dioxide. The method involves removing the noxious gases by directing them into a grinding mill, where they are absorbed by the alkaline slurry present in the mill. The method does not require the use of conventional absorption columns or gas scrubbers. In addition, the gas moving equipment following the wet grinding operation need not incorporate acid proof ducts, thus affecting a considerable saving in equipment cost.
APTIC-22039

GAS SCRUBBER APPARATUS AND PROCESS.

(Wellman-Lord, Inc., Lakeland, Fla.) U. S. Pat. 3,505,788. 4p., April 14, 1970. 2 refs. (Appl. May 23, 1968, 9 claims).
Aaron J. Teller, and Edward S. Wyatt.
Identifiers: *Packed towers, *Design criteria, Stack gases, Particulates, Fluorine compounds.

A gas scrubbing apparatus for recovering foreign materials, particularly fluoride gas and particulates, from a carrier gas is described. The carrier gas and foreign material are introduced tangentially into a vertical cylindrical recovery zone into which a washing liquid is radially sprayed. The foreign material is captured in a slurry and discharged. The gas then passes into a packed bed and second washing liquid to further remove contaminants. The bed is packed with a material having a nonadhering surface and a high free volume. The carrier gas then passes through another packed bed to remove entrained liquid. The advantages of this system over previous ones include low cost, fewer pieces of equipment, and no deposition of solid buildup. (Author abstract modified)
APTIC-22040

AIR FILTER.

(Van-Air Inc., Pa.) U. S. Pat. 3,505,794. 4p., April 14, 1970. 14 refs. (Appl. May 29, 1968, 11 claims).
Raymond W. Nutter, and Frederick M. Sitter.
Identifiers: *Filters, *Design criteria, Particulates, Hydrocarbons, Pressure.

A filter adapted for removing hydrocarbons and other contaminants from pressurized air is described. The filter is comprised of a housing having an inlet and and outlet and a replaceable microporous cartridge through which the air flows. The cartridge is composed of a composite sleeve-like member with an outer layer of fibrous material, a fibrous sheet layer of activated carbon particles, a backup filter layer of a relatively small porosity as compared to the porosity of the carbon

impregnated sheet, and a final layer of fibrous material. The advantages of this method over previous ones are its minimal pressure drop and its ability to prevent particles from the filter bed from being picked up and carried out with the air stream.
APTIC-22041

DUST COLLECTOR.

(Riley Stoker Corp., Worcester, Mass.) U. S. Pat 3,505,790. 5p., April 14, 1970. 25 refs. (Appl. Oct. 31, 1966, 7 claims).
Edmund F. Rothemich.
Identifiers: *Collectors, *Design criteria, Dusts, Fly ash.

A dust collector which assures no buildup of solids to restrict its effectiveness is described. Designed to remove dry powdered material such as flyash, the collecting hopper is independently supported from the main body of the collector and is fitted with electrical strain gauges to permit easy weighing of collected dust. An alarm mechanism is provided to warn the operator of accumulating material. The advantages of this system over previous ones are its ability to continuously monitor the collected material and its warning to prevent accidental overflow.
APTIC-22042

GAS FILTER APPARATUS.

(American Air Filter Co., Inc., Louisville, Ky.) U. S. Pat. 3,505,786. 3p., April 14, 1970. [illegible] refs. (Appl. Nov. 5, 1968, 5 claims).
Alan E. Revell, and Wilson A. Welch.
Identifiers: *Design criteria, *Electrostatic precipitators.

An electrostatic precipitator with an improved wall-washing device is described. The precipitator is of the plate electrode assembly type. The washing mechanism consists of a longitudinally extending pipe pivoted at one end to allow it to rotate in a plane parallel to the electrode plates. The pipe has several apertures in it. The washing fluid comes out the apertures and strikes the plates, and also serves to propel the washer in its circular rotational path. This washing method exhibits advantages over previous ones in that it does not require large amounts of water, it is relatively simple and inexpensive, and it does not require substantial amounts of space.
APTIC-22043

PHOTOGRAPHIC STUDIES OF PARTICLE BEHAVIOR UNDER VARYING PRECIPITATING CONDITIONS.

IEEE (Inst. Elec. Electron. Engrs.) Trans. Power App. Systems, 86 (3):365-368, March 1967. 3 refs. (Presented at the IEEE Winter Power Meeting, New York, Jan. 30-Feb. 4, 1966.)
G. W. Seman, and G. W. Penney.
Identifiers: *Operating variables, *Electrostatic precipitators, Dusts, Particle size, Photographic methods, Silicon dioxide, Ionization, Ions, Electric charge.

Photographic studies of particle motion in an electrostatic precipitator show that the inertial properties of the particles cannot be neglected in the considerations of their drift velocity in an electrostatic precipitator. A long focal length microscope was focused on a given spot inside the precipitator which was directly above the collecting electrode, while a slotted wheel was placed in front of the microscope objective. The effect of the wheel was to chop the light beam and cause a series of dashed lines which represent the trajectory. Knowing the angular velocity of the wheel and the number of slots in the wheel, it was possible to calculate the elapsed time between interruptions. The particles studied ranged from 40 to 200 micron in diameter. For transit times as great as 1/10 second, the distance traversed by a 30-micron diameter particle of silica was greater than the distance traversed by a 250-micron diameter particle to the same material. Large particles may rebound without losing their negative charge or they make knock off agglomerations of previously deposited dust which have a positive charge and so are accelerated away from the collecting electrode. The paths of particles become quite irregular when back ionization occurs. Occasionally particles are observed to reverse their charge in a few milliseconds, indicating that there are small regions of quite high density of positive ions. (Author abstract modified)
APTIC-22044

ANTI-AIR POLLUTION DEICE.

(Johnson-March Corp., Philadelphia, Pa.) U. S. Pat. 3,516,647. 7p., June 23, 1970. 9 refs. (Appl. July 11, 1967, 8 claims).
Sam Jaffe, and Gregory L. Thompson.
Identifiers: *Scrubbers, *Design criteria, Particulates, Baffles.

An inexpensive anti-air pollution device is described, which has no mechanical moving parts other than the fan throughout the air scrubbing portion of the system. Existing systems for removing impurities from air prior to exhausting the air into the atmosphere typically do so by means of either liquid or screen mesh type filters that are very expensive and must be replaced often. This device comprises a housing having an inlet chamber, a main chamber, and an exhaust apparatus for drawing the polluted air through the inlet and the main chambers. The main chamber further includes a first perforated member for distributing the air drawn from the inlet chamber uniformly through the inlet chamber; the inlet chamber and the main chamber have a common portion which acts as a receptacle for water. Water and the first member act to shred the polluted air as it is drawn through, and the water usable for relatively long periods of time. The screens and baffles do not act to filter the air as it passes through, but rather act to cause the shredding of the air to break it down into its finest molecules in order to be scrubbed by the water as contact is made. (Author abstract modified)
APTIC-22047

COLLECTOR FOR AUTOMOBILE EXHAUST SYSTEM.

(California Tube Producrs, Inc., Burbank) U. S. Pat. 3,516,247. 3p., June 23, 1970. 5 refs. (Appl. June 24, 1968, 2 claims).
Leon J. Knox Jr.
Identifiers: *Collectors, *Automotive emission control, *Design criteria, Internal combustion engines, Pressure.

A collector for an internal combustion engine is described, relating a plurality of tuned exhaust headers to a muffler and tail pipe assembly. By reducing the pressure against which the exhaust gases must move, a corresponding increase in horsepower of the engine is achieved. The apparatus is of one-piece construction with walls defining four externally directed openings for receiving, respectively, the outer ends of header pipes. These openings are arranged in two pairs which are aligned and which face upwardly away from each other with their axes generally in the same plane and with the inner ends of the header pipes abutting against shoulders formed on the inner walls of the openings. Uniformity in the total length of path the exhaust gas must follow is maintained for each header pipe by means of this internal shoulder. Each entrance opens into a separate passage or chamber, with all such chambers communicating with a single outlet. The volume capacity and total length of each header pipe and collector is such that at some predetermined rotative velocity of the engine, exhaust gas provided from a particular cylinder is emerging from the tail pipe at substantially the same time that the exhaust valves of the cylinder next in firing order are opening. In this manner the interior portions of the header system are periodically placed at a lowered pressure, scavenging exhaust gases and thereby enhancing operation of the engine and increasing its power. Complex welding operations have also been avoided.
APTIC-22048

APPARATUS AND PROCESS FOR TREATMENT OF EXHAUST GASES FROM INTERNAL COMBUSTION ENGINES AND CONTROLS FOR THE SAME.

(Assignee Not Given.) U. S. Pat. 3,481,144. 15p., Dec. 2, 1969. 2 refs. (Appl. Feb. 27, 1967, 7 claims).
Jacque C. Morrell.
Identifiers: *Internal combustion engines, *Automotive emission control, Operating variables, Air-fuel ratio, Fuel additives, Temperature.

To substantially complete combustion of the undersirable components of the exhaust gases from internal combustion engines when the concentration of the latter is insufficient to support combustion, additonal fuels and a forced supply of air are supplied directly to the combustion zone to increase the temperature when the latter falls below about 1450 F. The fuels are from the regular supply of the engine, as well as from the crankcase, vents of the carburetor, and the fuel tank. invention relates to a number of special control systems, alternative to each other and which permit controlling, cutting off, and diverting the primary and secondary fuels (and additional air) from the combustion chamber. When the speed of the automotive vehicle, or the temperature in the exhaust manifold, exceeds a predetermined point at which the gases contain the minimum of objectionable components, no added fuels are introduced into the combustion chamber. The secondary fuels may be simultaneously diverted to the intake manifold to be utilized as engine fuel instead of being discharged. The predetermined speed and the temperature of the exhaust manifold referred to are related to each other and are an index of the exhaust gas composition with respect to its normal combustible components without added fuels. Heat resistant refractory filling materials or lining are suggested for the combustion chamber. Various elements of the invention, operating conditions, and air-fuel ratios are discussed in detail. (Author abstract modified)
APTIC-22049

ENGLAND IS CUTTING ITS AIR POLLUTION.

For primary bibliographic entry see Field 14.
APTIC-22051

METHOD FOR REDUCING SULFUR COMPOUNDS FROM FLUE GASES.

(Assignee Not Given.) U. S. Pat. 2,718,4[illegible]. 2p., Sept. 20, 1955. 8 refs. (Appl. Jan. 3, 1951, [illegible] claim).
John W. Beckman.
Identifiers: *Alkaline additives, Stack gases, Fuels, Control equipment, Ammonia, Carbonates, Calcium compounds, Sulfur trioxide, Water, Vapors, Temperature.

A process for the elimination of sulfur dioxide and sulfur trioxide from flue gases is described. Certain chemical compounds when injected into a burning fuel in a combustion zone will react with the sulfur compounds to produce innocuous solid products. However, it has been found that the solid particles of the reaction may be deposited on the heat exchange areas. This problem can be eliminated if finely ground calcium carbonate is injected at some point other than the actual flame. It is preferred to introduce the calcium carbonate at a point in the heating installation where the temperature is above 350 F. The amount of calcium carbonate to be used can be calculated from the amount of sulfur in the fuel. This process is more efficient if there is a slight amount of water vapor and ammonia in the combustion gases. The final product of the reaction is calcium sulfate or calcium sulfite which can be recovered by an electrostatic precipitator, a cyclonic dust collector, or a bag house.
APTIC-22052

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IMPROVEMENTS IN THE PRODUCTION OF SULPHUR FROM GASES CONTAINING SULPHUR DIOXIDE.

(Imperial Chemical Industries Ltd., London (England)) Brit. Pat. 406,343. 5p., Feb. 26, 1934. (Appl. Aug. 24, 1932, 6 claims).
Daniel Tyrer.
Identifiers: *By-product recovery, *Sulfur compounds, Great britain, Stack gases, Coke, So2 removal (combustion products), Carbon monoxide, Iron oxides, Sulfur dioxide, Sulfides, Catalysts, Heat transfer.

This invention provides a means for converting to sulfur the carbon monoxide, carbon oxysulfide, and hydrogen sulfide formed by the reduction of sulfur dioxide-containing gases by carbonaceous materials. Previous processes for the reduction of sulfur dioxide gas produced considerable quantities of carbon monoxide, but it is proposed here to utilize the CO and also to remove the other undesirable by-product by reaction with further quantities of SO2. Waste gases containing 5% SO2 are first washed with an aqueous solution containing monosodium phosphate and sodium citrate, then passed through a heat-exchanger to a coke reducer at 6000 cu m per hr. The temperature of the coke is raised initially to 1100 C and the reaction process is sufficiently exothermic to maintain this temperature. Reaction gases are then subjected to catalysis at 600-800 C in one or more chambers to effect a reaction between carbon monoxide, hydrogen sulfide, carbon oxysulfide, and residual or added sulfur dioxide. Iron oxide is the preferred catalyst. The sulfur present in the exit gases is condensed in the form of liquid sulfur or flowers of sulfur. Residual gases remaining after removal of the sulfur can be recirculated in the initial concentration state or utilized for the production of sulfuric acid.
APTIC-22053

A PROCESS FOR THE DESULPHURISATION OF GASES.

(Sulfur-Chemie Aktiengesellschaft, Cologne (West Germany)) Brit. Pat. 459,418. 6p., Jan. 7, 1937. (Appl. March 2, 1936, 14 claims).
Personal Author Not Recorded.
Identifiers: *Absorption (general), *Hydrogen sulfide, *Thiosulfate, Germany, Organic sulfur compounds, Flow rates, Pressure, Temperature.

A process for removing sulfur dioxide and hydrogen sulfide from gases by thiosulfates in which the formation of polythionates is prevented is described. An intense mechanical movement is imparted to a thiosulfate solution and gases containing H2S and SO2 are simultaneously introduced so that the thiosulfate content of the solution is reduced to a predetermined degree, and a neutral reaction and the original total sulfur content is maintained in the solution. The gases to be freed of H2S and SO2 are treated in two phases with this activated solution. In the first phase, the thiosulfate solution is activated and 90-95% of the sulfur in the gases is removed. In the second phase, the sulfur content of the remaining gases is removed by the activated solution. In a third and independent phase, the SO2 is absorbed. Solution from the second phase is conducted to the third phase where sulfur, by combustion, is converted to SO2 which is washed out with the solution. The SO2-containing solution is introduced into the activation phase to avoid the formation of polythionates. To maintain a constant degree of activation, the volume and concentration of the solution are regulated in accordance with the absorption coefficient of H2S and the flow velocity of the gases. Beyond this degree, additional H2S is added so that 90-95% of the total H2S is absorbed in the first phase. This process is conducted at 80-100 C and under a pressure which is not lower than the atmospheric pressure.
APTIC-22054

A CYCLIC PROCESS OF SULPHURIC ACID MANUFACTURE AT TRAIL, B. C.

For primary bibliographic entry see Field 06.
APTIC-22055

PROCESS FOR REDUCING NITRIC OXIDE TO NITROUS OXIDE.

(Shell Oil Co., New York) U. S. Pat. 3, 321, 274. 2p., May 23, 1967. 6 refs. (Appl. Dec. 13, 1963, 1 claim).
Lynn H. Slaugh.
Identifiers: *Nitric oxide (no), *Sulfur dioxide, *Reduction, Alcohols, Hydrogen, Nitrous oxide (n2o), Sulfides, Catalysts, Pressure, Temperature.

The reduction of sulfur dioxide and nitric oxide has been accomplished at relatively high temperatures. Several catalysts are known to aid in the reduction of SO2, but they generally require a temperature above 270 C. Nitric oxide can be reduced in the presence of hydrogen and a metal catalyst at temperatures ranging from 200 to 400 C. A process is described for reducing SO2 and NO at relatively moderate temperatures. Sulfur dioxide and NO may be reduced by hydrogen in the presence of a rhenium heptasulfide catalyst at temperatures ranging from 20 to 150 C. The SO2 or NO may be pure or mixed with other gases; the sources of NO or SO2 to be reduced are not limited. The gaseous mixture consisting of hydrogen, and SO2 or NO may be passed over the catalyst so that there is direct contact between the solid catalyst and the reacting gas, or the catalyst may be suspended in a solvent so that the gas is dissolved and the reduction occurs at the liquid-solid interface. Alcohols and liquid hydrocarbons are suitable solvents. Pressure within the reaction zone may be subatmospheric, atmospheric, or superatmospheric. The relative proportions of hydrogen to NO or SO2 are not critical. However, hydrogen in excess of the stoichiometrically needed amount is preferred.
APTIC-22056

PROMISE SEEN IN STACK-GAS SO2 REMOVAL.

Oil Gas J., 64 (18):53, May 2, 1966.
Personal Author Not Recorded.
Identifiers: *So2 removal (combustion products), Stack gases, Coal, Fuel gases, Bag filters, Glass fabrics, By-product recovery, Catalytic oxidation, Hydrodesulfurization, Aklaline additives, Sulfuric acid, Sulfur trioxide, Temperature.

The progress of three companies in removing sulfur dioxide from stack gases is reported. The Babcock and Wilcox process involves injecting dolomite, or other alkaline additives, into the hot stack gases and then filtering them through fiberglass filter bags. Efficiency of sulfur recovery has not been disclosed, but it is believed that this process will prove satisfactory when used on large power plants. The Monsanto process will remove SO2 from flue gas by oxidizing it to trioxide, and then condensing the latter to sulfuric acid. Based on a 3% weight fuel, the cleaned gases from the precipitator would contain 2000 ppm SO2 and 20 ppm SO3. In passing through the catalyst bed, the SO2 concentration is reduced to 200 ppm and that of SO3 increased to 2300 ppm. In a rotary air preheater, the 600 F temperature drop causes the formation of sulfuric acid mist which is collected and removed as sulfuric acid. About 90% of the stack gas sulfur was recovered at a concentration of 70% sulfuric acid in pilot plant tests. Combustion Engineering's process has not been tested outside the laboratory. However, these tests were encouraging in that the sulfur content of the gases was greatly reduced. It is believed that this process will be confined to large industrial sources due to the expense of the treating equipment. The hydrodesulfurization of residual fuel oils is briefly discussed.
APTIC-22057

GAS CLEANING WITH SCRUBBERS.

J. Metals, 17 (6):670-672, June 1965.
J. E. Johnson.
Identifiers: *Open hearth furnaces, *Venturi scrubbers, Stack gases, Dusts, Primary metallurgical processing, Baffles, Fans (blowers), Design criteria, Temperature.

The use of oxygen in the steelmaking process has had a great impact on the steelmaking industry, and the change to oxygen lanced open hearth furnaces has led to changes in the type of gas cleaning equipment used. Venturi scrubbers have been found to efficiently and economically remove submicron size particles from the hot gas streams. Waste gases up to 1800 F flow up the hot stack and are diverted to the scrubbers where they are cleaned by the scrubbing water. The cleaned gas, at about 166 F, enters a separator where it expands, losing some moisture, and then flows up through redwood baffles where additional moisture is removed. The gas then enters a fan and is discharged to the atmosphere through a cold stack. Recycle water is pumped into the throat area where it is atomized by the turbulence of the water and gas flowing through the throat. Cleaning the gas is accomplished as the submicron size particles collide with and become entrained in the atomized water droplets. The heart of the venturi is a simple venturi made in three sections with two rows of nozzles arranged on either side of the throat. Adjustable pipes operating from both ends of the throat can throttle the throat area by 50%. The design of the recycle and slurry systems are also presented.
APTIC-22058

THE FUTURE IN AIR POLLUTION CONTROL.

Heating, Piping, Air Conditioning, 39 (12):65-68, Dec. 1967.
John H. Ludwig.
Identifiers: *Administration, *Control methods, Control programs, Research programs, Economic losses, Feasibility studies, Clean air act, Standards, Chronic, Eye irritation, Respiratory diseases, Corrosion, Automotive emission control, Sulfur oxides control, Hydrocarbons, Carbon monoxide, Nitrogen oxides, Sulfur oxides.

The future in air pollution control with respect to legislation, research, and methods is discussed. Air pollution causes respiratory diseases, from the common cold to lung cancer, eye irritation, and chronic ailments from long-term exposure. It causes economic losses by corroding metal structures, and damaging crops, livestock, forests, and ornamental plants. Under the Clean Air Act, several state abatement programs have been initiated, standards have been published to control automotive emissions, and research efforts have been increased. However, implementation of existing control methods and research into improved methods must continue simultaneously. The federal government is conducting feasibility studies on control devices for automobiles. Fuel injection and techniques of accelerated warm-up are being investigated, along with reproducible methods for evaluating diesel smoke and odor. The effectiveness of catalytic mufflers, fuel injection modifications, engine derating, fuel additives, exhaust dilution, maintenance, fuel quality, and electrostatic precipitation are being evaluated. Systems for the control of nitrogen oxides, particulates, hydrocarbons, and carbon monoxide are also being developed. A variety of control processes are needed for sulfur oxides ranging from switching to gas for the small commercial user to developing new power systems where desulfurization is an integral part of the system.
APTIC-22059

OZONE OXIDATION OF DIMETHYL SULFIDE AND DEODORIZING OF KP BLOW-GAS.

(Jimechiru sarufaido no ozonsanka to KP burogasu no mushuka ni tsuite). Text in Japanese.
Kami-pa Gikyoshi (J. Japan. Tech. Assoc. Pulp Paper Ind.), 22 (4):200-204, April, 1968. 7 refs.
K. Akamatsu.
Identifiers: *Kraft pulping, *Black liquor oxidation, *Odor counteraction, Trees, Japan, Stack gases, Odors, Organic sulfur compounds, Sulfur dioxide, Ozone, Sulfur compounds, Hydrogen sulfide.

The main cause of obnoxious odor from kraft pulping (KP) is in the sulfur compounds that arise in the process. Sulfur compounds in reduced form are odoriferous whereas those in oxidized form are either odorless or just irritants. Tables are presented on the amount of dimethyl sulfide (DMS) that can be retrieved from KP black liquor at various temperatures and with different amounts of Na2S added. Different quantities of organosulfur compounds released in KP of different types of trees are listed for various pulping conditions. In general, the broad-leaved trees yield more odorant substances than do the coniferous trees. The data were obtained by a process similar to the theoretical method, and the quantity of organosulfur compounds from real KP process is probably much smaller. The gaseous sulfur loss balance sheet for two factories in the South (U. S.) show that most of the sulfur released is in the H2S emitted from the recovery furnace, followed by sulfur dioxide gas and DMS. A brief description of a process for deodorizing DMS by ozone oxidation is given. However, unless inexpensive methods are found for the production of ozone, the method is still far from application.
APTIC-22061

IMPROVEMENTS IN OR RELATING TO WASTE GAS PURIFICATION.

(Peter Spence and Sons Ltd., Widnes (England)
Brit. Pat. 1,097,306. 6p., Jan. 3, 1968. (Appl. March 19, 1964, 12 claims).
John Kerr.
Identifiers: *Peter spence process (claus), Great britain, Stack gases, By-product recovery, Sulfur compounds, Hydrogen sulfide, Catalysts.

A method is described for the removal of sulfur dioxide from flue gas or other waste gases containing not more than 5% by weight of SO2 by means of the Claus reaction. The hydrogen sulfide required for the reaction is generated outside the flue gases, and mixed with the gases in the presence of a catalyst to react with the SO2 to form elemental sulfur. The H2S is injected continuously into a stream of flue gas at 125 to 150 C in not more than the stoichiometric quantity required for reaction, while the catalyst is continuously circulated by a pump apparatus, through the reactor system, and back to the storage unit. The catalyst may be re-cycled in a line contacting system, in a falling curtain, fluidized bed or other arrangement in which power requirements are economically acceptable. Several possible ways of regenerating the catalyst are described. Many catalysts are suitable for the Claus reaction- bauxite, active aluminas, active titania, mixtures of iron and aluminium oxides, zeolites, and fire brick. Sulfur is much more attractive than sulfuric acid as a by-product when considering that by-products should have a potential market greater than their availability, be capable of being stored readily, and should not be expensive to transport over reasonable distances.
APTIC-22062

CANADIAN SULFUR ON THE WAY.

For primary bibliographic entry see Field 06.
APTIC-22063

CLEANING AIR, COLLECTING DUST: EQUIPMENT REVIEW.

Filtration Separation (Purley), 5 (3):256, 258, 260, 262-264, May-June 1968.
Personal Author Not Recorded.
Identifiers: *Dusts, *Control equipment, Great britain, Centrifugal separators, Electrostatic precipitators, Filters, Bag filters, Filter fabrics, Scrubbers.

Among the new dust collecting equipment reviewed are mini filters with automatic reverse air cleaning; jumbo filters which use already filtered air for automatic bag cleaning; a high-temperature bag filter for cleaning gases with inlet temperatures up to 600 F and having no moving parts; small tube cyclone collectors; packaged electrostatic precipitators with unbreakable point discharge electrodes; and automatically cleaned fabric filters the frequency of cleaning of which can be pre-set. Also included are bonded acetate fibrous filters with dust loading capacities between 500 grams at 0.25 in swg resistance and 1500 grams at 0.38 in swg when handling 1000 cfm; bag filters for recovering valuable by-products from continuous manufacturing processes; prepackaged dust extraction units that handle volumes from 400-4000 cfm, coupled with filters having a filter area from 50-375 sq ft, with built-in fan units; cloth-tube collectors for removing particulates at gas temperatures below dew point; wet dust collectors for gas flows between 2000-4200 cfm; wet scrubbers with single or double spray or water eliminator from 500-20,000 cfm in a single unit; and a continuous automatic cleaning unit that maintains a constant air flow across wool felt filters for 24 hrs per day. The appropriate applications of the various dust collectors are noted.
APTIC-22068

THE ELIMINATION OF DUST AND SULPHUR FROM BOILER FLUE GASES.

J. Inst. Fuel (London), vol. 6:226-233, April 1933, 3 refs.
H. E. Wallsom.
Identifiers: *Dusts, *Electric power production, *Control equipment, *Sulfur oxides control, Great britain, Stack gases, Fumes, Boilers, Stacks, Centrifugal separators, Electrostatic precipitators, Scrubbers, Coal preparation, Design criteria, Sulfur compounds.

British power stations are now required to reduce as far as reasonably practicable chimney emission of flue dust and sulfur fumes. General methods available for minimizing the flue dust problem are pretreatment of coal; suitable chimney design; and dust collection by electrical precipitators, centrifugal collectors, or washing. Methods available for the removal of sulfur compounds from flue gas are as follows: washing by water; washing with a solution or suspension of alkaline material; the reduction of sulfur compounds to elemental sulfur; the oxidation of sulfur compounds, for example, to sulfuric acid; the interaction of the sulfur compouds with an alkaline gas, and the recovery of the compound formed by water washing. A comparison of the efficiencies of these methods shows that wet systems are highly efficient in abating dust and fume emissions. For fine dusts, either electric precipitaton or washing is recommended; for larger dust particles, centrifugal collectors would probably be satisfactory. The deciding factor in the choice of electric or wet processes is the facility with which large quantities of water can be obtained and disposed of. When wet washing it used, corrosion-resistant lead linings are recommended for washing chambers and stacks.
APTIC-22070

INSTRUMENTS AND CONTROLS FOR INDUSTRIAL POWER PLANTS.

Nat. Eng., 73 (7):10-12, July 1969. (Presented at the Industrial Fuel Oil Conference, 7th, of the Illinois State Association, National Association of Power Engineers, Chicago, Ill., May 21, 1969.)
Jack Douglas.
Identifiers: *Boilers, *Steam plants, *Control equipment, Electric power production, Measurement methods, Air-fuel ratio, Design criteria, Combustion.

Large power plants have long known the importance of carefully designed combustion control systems. The need to reduce air pollution and operational costs now requires similar control planning on the part of small boiler installations. Automatic draft controls should be provided for pressurized boilers, in which pressure at the boiler exit tends to vary with burner firing rates. Such controls make it possible to maintain relatively constant boiler output pressure or temperature, thus insuring proper air/fuel ratios for efficient combustion. Equally important is the boiler's utilization of the heat generated. All steps of steam generation should be checked by a flue temperature gauge which shows the degree to which the boiler has absorbed the heat generated. Another measure of boiler efficiency is the amount of oxygen in the flue gas. Reliable paramagnetic instruments are available for these measurements. Finally, master lead-lag sequence controllers, which treat all boilers as one in supplying the load demand, should be provided in multiple boiler installations. These devices increase the life of packaged boilers and eliminate the need for constant human monitoring.
APTIC-22071

REMOVAL OF SO2 IN COMBUSTION GAS BY INJECTING POWDERS OF LIMESTONE, CALCIUM HYDROXIDE, AND DOLOMITE.

Electric Power Industry, Tokyo (Japan), Central Lab., 1p. 1 ref. Translated from Japanese. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 3p., Nov. 11, 1969.
Yoshimi Ishihara, Chuhei Asakawa, and Hisashi Fukuzawa.
Identifiers: *Alkaline additives, Limestone, Japan, Combustion products, Combustion gases, Operating variables, So2 removal (combustion products), Carbonates, Calcium compounds, Reaction kinetics.

As determined by laboratory experiments, sulfur dioxide evolved in a small combustion furnace is removed at an equal rate by limestone, calcium hydroxide, and dolomite powders. The reactivity of SO2 with limestone is improved by adding ochre to the powder or using a lime containing more than one percent iron. In the case of calcium hydroxide, a higher SO2 removal rate is obtained by injecting the compound in slurry rather than powdered form.
APTIC-22074

OPERATORS, MANUFACTURERS, GOVERNMENT JOIN THE BATTLE TO CONQUER AIR POLLUTION.

For primary bibliographic entry see Field 01.
APTIC-22088

DESIGN AND CONSTRUCTION OF A PERMEABILITY CELL FOR SEPARATING MIXTURES OF CARBON DIOXIDE AND OXYGEN.

State Univ. of Iowa, Ames, Dept. of Chemical Engineering. Thesis (M. S.), June 1964, 72p. 14 refs.
Richard W. Tock.
Identifiers: *Membrane filters, *Carbon dioxide, *Oxygen, Design criteria, Polymerization, Gases, Permeability.

The feasibility of a unique gas permeability cell system for removing carbon dioxide from binary mixtures of oxygen and carbon dioxide is investigated. Silicone rubber is used for the permeable membrane of the cell. Ordinary Nibroc brown paper hand towel is used for the supporting substrate. A new process for laminating film is developed whereby the film is allowed to partially polymerize before application of the substrate. The basic shape of the cell is that of a multilayer Greek cross. This type of construction greatly facilitates the admittance and withdrawal of the various gas streams. A typical cell is tested at 0, 25, and 40 C for various binary mixtures of carbon dioxide in oxygen ranging in concentration from 1 to 10% CO2. The data are plotted as product/feed against concentration of CO2 in the product. (Author abstract modified)
APTIC-22095

ON THE USE OF FOAM EQUIPMENT FOR SULFUR DIOXIDE REMOVAL.

(K voprosy primeneiya pennykh apparatov dlya ulavlivaniya dvuokisi sery). Text in Russian.
Azerb. Neft. Khoz., no. 8:38-40, 1965, 4 refs.

F. M. Ragimov, A. Ye. Kalaushin, L. S.
Leont'eva, A. Kh. Frumkina, and D. T. Kas'an.
Identifiers: *Absorption (general), *Hydroxides, Ussr, Stack gases, Petroleum production, Potassium compounds, Sodium hydroxide, Flow rates, Temperature.

The possibility of using 1-, 2-, and 3-tray foam equipment to remove sulfur dioxide from petroleum-refinery exhaust gases was demonstrated experimentally; the 3-tray arrangement was the most efficient. Using 4-8% aqueous solutions of calcinated soda, caustic soda, and industrial alkaline wastes at 15-35 C with a gas-air mixture flow rate of 0.6-3.7 m/sec, SO2 removal was 99.9% effective; exhaust content was reduced to 0.0006%. Industrial alkaline wastes are recommended as a practical SO2 absorber for use in foam absorbers.
APTIC-22096

FERTILIZER FROM FLUE GASES'

New Scientist, 36 (569):281-283, Nov. 2, 1967.
Graham Chedd.
Identifiers: *By-product recovery, *Absorption (general), Great britain, Stack gases, Electric power production, Aluminum compounds, Sodium compounds, Sulfur compounds, Hydrogen sulfide.

A modification of the American alkalized alumina process for recovering elemental sulfur from flue gases may make it possible for British power plants to reduce atmospheric contamination by sulfur dioxide and at the same time reduce the dependency of British fertilizer and sulfuric acid manufacturers on sulfur imports. In the original process, flue gases are passed upward through a rain of alkylized alumina spheres. The absorbent containing the sulfur dioxide is then passed to a regenerator where it is heated and treated with producer gas to recover sulfur as hydrogen sulfide. After oxidation of one-third of the hydrogen sulfide to sulfur dioxide, the two gas streams are mixed and passed over a bauxite catalyst. Elemental sulfur is produced. In the British modification, the rain of alkylized alumina particles is replaced by a fluidized bed of high-porosity sodium aluminate. Sulfur dioxide from the flue gases diffuses into the pores of the alumina and reacts to form a mixture of sodium sulfate, sodium sulfite, and aluminum oxide. The mixture is passed to a solids regenerator where it reacts with hydrogen to form hydrogen sulfide. The rest of the process is similar to the original. The process could reduce the sulfur import bill by 1.2 million pounds per year and stabilize sulfur processes.
APTIC-22103

VAPOR PRESSURE AND THERMODYNAMIC PROPERTIES OF AMMONIUM SULPHITES.

Bureau of Mines, Washington, D. C., Rept. of
Investigation 3339, p. 19-29, May 1937. 2 refs.
Hillary W. St. Clair.
Identifiers: *Ammonium compounds, *Sulfur dioxide, *Reaction kinetics, *Vapor pressure, Absorption (general), Sulfites, Decomposition, Pressure, Thermodynamics, Temperature.

The results of investigations of the equilibria existing in the solid and gaseous phases of the system ammonia-sulfur dioxide-water are given. There are four crystalline compounds in the system: anhydrous ammonium sulfite; ammonium bisulfite; hydrated ammonium sulfite; and ammonium pyrosulfite. Of these compounds, the pyrosulfite is the only one that decomposes directly into its gaseous components; consequently it is the only one whose vapor pressure is measured. Equilibrium equations and constants for the possible reactions are given. The results indicate that the use of ammonia in dust settling and sulfur recovery is practical only at fairly low temperatures. It is theoretically possible to work a cyclic process for recovering SO2 from ammonium pyrosulfite, which involves simply a control of temperature and pressure. (Author abstract modified)
APTIC-22104

REMOVAL OF SULPHUR OXIDES FROM FLUE GAS: THE REINLUFT PILOT PLANT.

Warren Spring Lab., Stevenage, U. K.,
Atmospheric Pollution Div., LR 15 (AP), 27p.,
Sept. 1965. 4 refs.
L. E. Reed.
Identifiers: *Reinluft process (adsorption), Carbon black, Corrosion, Great britain, Stack gases, Coal, Operating variables, Pilot plants, Design criteria, Acids, Condensation, Flow rates, Pressure.

Pilot plant tests on the adsorption and desorption of sulfur oxides in the Reinluft process are discussed. This process can be operated continuously at an efficiency of over 90% and the sulfur oxides can be recovered as sulfur dioxide at a concentration of about 3%. The process is not, however, sufficiently well developed to be applied to a large scale process. It was necessary to replace carbon due to attrition losses in the elevator and plant and chemical losses in the desorption process. An initial loss of 16% of the charge in the first 40 hours and subsequent losses of 4%/day were recorded in one test; since carbon replacement is likely to be a major item, this indicates that these costs could be prohibitive. The uptake of SO2 by the carbon was only 6-7% whereas bench scale tests indicated that 12% uptake would be easily obtained. At the design throughput of 450 cu m/h, the pressure drop through the absorber bed was approximately 7.6 cm H2O. Most of the mechanical breakdowns were caused by corrosion; these were most severe when it was necessary to operate for short periods, each of which produced a corrosive acid condensate. If the process is used on a coal-fired plant it will be essential to clean the gases before and after treatment.
APTIC-22110

UNDERGROUND STORAGE OF LIQUEFIED NATURAL GAS: FIRST STUDIES AND PROJECTS OF GAZ DE FRANCE.

(Stockage souterrain de gaz naturel liquefie:
premieres etudes et projets du gaz de France).
Text in French. Preprint, American Gas
Association, Inc., New York, 11p., 1962.
(Presented at the Conference of the American Gas
Association Boston, Mass., June 4, 1962.)
H. Bresson.
Identifiers: *Natural gas, *Compressed gases, *Storage facilities, France, Soils, Operating variables, Design criteria.

The possibilities of importing liquefied natural gas, (LNG) by special transport ships and storing it to take care of contingencies of sea transportation were studied. The storage in surface tanks is unsafe. The recent development of underground storage of liquefied petroleum gas, (LPG) suggested the possibility of extending this technique to low-temperature storage of LNG. Theoretical studies, begun in 1958 were followed by laboratory investigations, then by experiments with small-volume subterranean cavities and culminated in a pilot project for building and operating an underground storage tank at LeHavre, France. In the theoretical studies, analytical solutions of the problems of temperature and thermal stress distributions in the ground surrounding a spherical cavity the walls of which are maintained at the temperature of boiling methane, were obtained. The heat flux into a tank of industrial size results in an acceptably small rate of evaporation of the LNG, even in the absence of heat insulation in the wall; the O C isotherm remains during use of the tank, at such a distance from the walls that freezing of the ground at the surface can be avoided by burying the tank at a reasonable depth (more than 30 m); a very high lateral traction exists at the wall of the cavity which should lead to the formation of radial fissures; the highest stresses are attained in the steady state, so that special filling schedules to maintain the temperature gradient at the wall below a given value appear to be unnecessary. Laboratory investigations were devoted largely to determinations of low-temperature properties of rocks and dry and wet soils.
APTIC-22117

MAGNETIC SEPARATION OF PYRITE FROM COALS.

Bureau of Mines, Washington, D. C., Rept. of
Investigation 7181, 25p., Sept. 1968. 30 refs.
Sabri Ergun, and Ernest H. Bean.
Identifiers: *Coal characteristics, *Magnetic separation, *Iron compounds, *Sulfides, Temperature.

Previous studies of magnetic separation of pyrite from coals are reviewed critically. Magnetic susceptibilities of United States coals of differing rank are measured. The effects of crushing, magnetic mixing, drying, weathering, and heat treatment on the enhancement of the magnetism of pyrite are analyzed. The importance of size distribution of pyrite in the coal and the necessity of crushing to liberate the pyrite is discussed. The inherent susceptibilities of the carbonaceous, mineral-free portions of coals and of relatively pure pyrite isolated from coals do not permit efficient separation of pyrite from coal. Friction forces encountered in crushing sedimentary pyrite embedded in coal do not increase its susceptibility. Subsequent weathering or heat treatment below 400 C leads to the formation of iron sulfate and hence increases the effective paramagnetism of pyrite. Ferromagnetic compounds of iron are not formed in significant quantities at temperatures below 400 C. The degree of liberation and apparent susceptibility of pyrite are the most important parameters in its separation. Effective beneficiation of coals can be achieved by magnetic separation. A sufficient increase in the susceptibility can be achieved by converting less than 0.1% of pyrite into ferromagnetic compounds of iron. Such conversions occur only at temperatures greater than 500 C. An investigation of the dielectric properties of coals and pyrite in the frequency range 0.1 to 60 Mhz indicates that the imaginary dielectric constant of the pyrite is about 100 times larger than that of coal. Exploratory experiments indicate that pyrite can be selectively heated to temperatures above 500 C without appreciable rise in the temperature of coal. It appears that dielectric heating of coals in the Ghz frequency range is the most feasible method of enhancing the paramagnetism of pyrite. (Author abstract modified)
APTIC-22127

3. MEASUREMENT METHODS

APPLICATIONS OF A PHOTOMICROSCOPIC TECHNIQUE TO THE PARTICLE SIZE ANALYSIS OF A SAMPLE FROM A NUCLEAR CRATERING CLOUD.

Preprint, California Univ., Livermore, Lawrence
Radiation Lab., 23p., Sept. 4, 1969. 10 refs.
CFSTI: UCRL-71837
Gerald F. Rynders.
Identifiers: *Particle size, *Microscopy, Dusts, Nuclear explosions, Fallout.

A particle size distribution was obtained for a sample collected by an aircraft from a cloud resulting from a nuclear cratering experiment. Because of the large size range of particles encountered in the initial sample, a sedimention technique was used to reduce the range in a particular counting field. A photomicroscopic technique in conjunction with a particle size analyzer was used. The distribution obtained, while essentially log-normal, could be fitted to an exponential relationship. A number of subpopulations were observed which would be expected to have separate distributions, although these were not evaluated. Errors of restricted sample size were attached to the final values. Recommendations are presented for further improvement of such analysis. (Author abstract)
APTIC-15593

GAS LASER STUDIES IN THE 100 TO 1000 MICRON RANGE. (FINAL REPORT.)

Illinois Univ., Urbana, Electro-Physics Lab.,
Grant SREE/AFOSR 804-65, Proj.-Task 9768-02,
Rept. AFOSR 66-0719, 8p., Dec. 31, 1965. 4 refs.
CFSTI, DDC: AD 632306
Paul D. Coleman.

Identifiers: *Lasers, Experimental equipment, Infrared radiation, Visible radiation, Gases, Vapors.

Research on gas lasers in the 100 to 1000 micron range is summarized. A description and experimental results of a water vapor laser covering the 48 to 118 micron range is included, together with a brief description of an ethyl amine gas laser with lasing lines at 337 micron. A new technique of splitting the gas laser in two parts and pulsing them seperately at either simultaneous or delayed times has given some new data on the laser. In water vapor, a radiation decay of 18 microseconds was observed. Research problems to be explored in the future are discussed, along with a brief comparison with electronic methods of generation. An attempt will be made to locate as many organic gases and liquids as possible with lasing lines beyond 400 micron. To go beyond one mm wavelength, microwave electronic devices must be microminiaturized to the point where they become prohibitively expensive. Gas lasers, on the other hand, are necessarily larger, with generous tolerances, thus keeping costs down. Far infrared radiation will be a useful diagnostic tool in terms of superconductors, molecular energy research, and materials research.
APTIC-15596

SCANNING ELECTRON MICROSCOPY.

Current Lab. Practice, 1 (1):6-11. Dec. 1968. 14 refs.
E. Bulba.
Identifiers: *Particulate classification methods, *Electron microscopy, Pollutants, Particulates, Aerosols, Suspended particulates, Fly ash, Fumes, Ragweed, Measurement methods, Particle size, Microscopes, Aromatic hydrocarbons, Sodium compounds, Sodium chloride, Iron oxides, Silicon compounds.

Scanning electron microscopy, a modified application of conventional transmission electron microscopy, forms an image that resembles that obtained with reflected optical light microscopy, but with much greater depth of focus and at much higher magnifications. The object is scanned by an extremely fine electron beam or probe, and as the probe sweeps over the object a sequential emission of electrons is generated depending upon the physical characteristics of the object. The emerging electrons are collected, and after suitable amplification by a photomultiplier tube, produce a signal voltage. This voltage modulates the brightness of a display cathode tube whose screen is scanned in synchronism with the object. Thus, sequential imaging is obtained. Preparation of samples is considerably simpler than in any other method available and the details that can be observed may provide new and valuable insights into the origin and behavior of atmospheric particulates. Some comparative micrographs of common environmental materials found in air pollution are presented.
APTIC-18129

SOLVENCY AND SOLVENT RETENTION STUDIES FOR COMPLYING VINYL SOLUTION COATINGS.

For primary bibliographic entry see Field 01.
APTIC-18133

ANALYSIS OF TALL OIL BY GEL PERMEATION CHROMATOGRAPHY.

Anal. Chem., 40 (6):989-992, May 1968.
Teh-Liang Chang.
Identifiers: *Tall oil, *Gel permeation chromatography, Analytical methods, Chromatography, Column, By-product recovery, Black liquor, Acids, Organic.

The separation of resin acids from fatty acids by gel permeation chromatography (GPC) was investigated as a promising method for tall oil analysis because it is based on molecular size. A cross-linked non-ionic polystyrene polymer was selected for the column substrate. A tall oil sample eluted through the GPC column separated into several peaks, each of which was denoted by its distribution coefficient, independent of flow rate, column length, and solute concentration. Carbon 18 fatty acids, resin acids, or fatty acid dimers gave a well-defined peak which confirmed the assumption that resin acids and fatty acids with similar molecular structure would possess similar distribution coefficients. The linear relationship found to exist between the logarithms of the molecular size and its elution volume or distribution coefficient was employed to predict the identity of unknown peaks observed in this study. It was found that the GPC method has several advantages over other methods. The analysis is carried out at room temperature and a complete analysis of acid components is made in a single experiment. Tall oil is analyzed for fatty acids, resin acids, fatty acid dimers, and resin acid trimers. No pretreatment of the sample, such as esterification, is required. The original constituents of the sample are not destroyed and can be recovered for subsequent identification by established techniques.
APTIC-18212

INVESTIGATION AND APPRAISAL OF FLU-GAS DAMAGE.

For primary bibliographic entry see Field 08.
APTIC-18226

PERTAINING TO THE DIAGNOSIS OF DAMAGE INDUCED BY FLUORINE-FUMES.

(Zur Diagnose von Fluor-Rauchschaden.)
Translated from German. Phytopathol. Z., 5 (2):195-206, (1932). 15 refs.
G. Bredemann, and H. Radeloff.
Identifiers: *Plant damage, *Chemical methods, *Hydrofluoric acid, *Fluorine compounds, Plants (botany), Crops, Corn, Fruits, Leaves, Vegetables, Mottling, Plant growth, Combustion gases, Stack gases, Suspended particulates, Fumes, Industrial emission sources, Fertilizer manufacturing, Analytical methods, Colorimetry, Acids, Inorganic acids, Fluorides, Silicon compounds.

An analytical method of analysis to verify fluorine (F) damage to plants is needed because F action shows neither unique nor consistent symptoms. Fluorine compounds attack fruits or enter plants through leaf stomates and decompose into hydrofluoric acid, which then acts on the mesophyll or spongy parenchyma. Several microchemical methods are used for F determination, two of which are particularly suitable for qualitative detection in plants. In the color method of Feigl and Krumholz, F is indirectly identified by the analysis of a process distillate for volatile silicon fluoride. Here, silicon is identified by an analytical method imparting a blue color to the solution. The second method crystallizes F as Na2 Si F6. Both techniques are shown to be sensitive to small amounts of F, 0.005 mg and 0.05 mg per 100g of dry leaves, respectively, but the latter is simpler and more direct. Experiments with various plants show that in nearly every case neither method gives deceptive, false positive results from naturally present F. It appears possible, however, to get negative results for F presence from plants previously damaged by F in earlier stages of development and from fruits damaged by extremely small amounts of F. Experiments also show that plants exposed to soils with unusually large amounts of apatite or phosphate fertilizer containing fluorides do not pick up detectable amounts of A and show no F damage. Seed germination is inhibited when the concentration of a soluble fluoride (e.g. NaF) is between 0.1 and 0.5 percent. Conveniently, soluble F components from soil can only be detected in the few cases when toxic effects are present. Thus, the simpler Na2SiF6 crystallization test is recommended for standard examinations, and the color test for cases where damage from a minute quantity of F is suspected and a negative crystallization test results.
APTIC-18230

SENSORY EVALUATION OF DIESEL EXHAUST ODORS.

Public Health Service, Raleigh, N. C., National Air Pollution Control Administration, Contracts PH 27-66-96 and CPA-69-528, 67p., February 1970.
CFSTI: PB 192 224, NAPCA: AP-60
Amos Turk, Janet T. Wittes, L. R. Reckner, and R. E. Squires.
Identifiers: *Odors, *Diesel engines, *Odorimetry, *Exposure methods, *Simulation, *Exposure chambers, Humans, Adults, Automotive emissions, Engine exhausts, Fumes, Transportation, Power sources, Internal combustion engines, Air quality measurements, Chemical composition, Measurement methods, Controlled atmospheres, Experimental methods, Statistical analyses, Testing facilities, Criteria, Air quality criteria, Personnel qualifications, Standards, Air quality standards, Emission standards.

Exhaust gases, not necessarily toxic, emitted by diesel engines, are characterized by offensive odors which can be rated numerically by human judges. Correlations of such ratings with the chemical composition of diesel exhaust will aid in establishing Federal standards for diesel exhaust emissions and developing methods of diesel odor control. An outline is presented for the development of programs in which human panelists selected for superior olfactory ability can be trained to rate odors in terms of quality and intensity relative to reference standards. These techniques are being applied in much of the PHS-sponsored research involving air pollution by diesel engines. Further work undertaken to develop and extend earlier studies is summarized. Described is the physical arrangement of an exhaust dilution and panel exposure system designed to simulate on-the-street exposure to emissions. Instructions for conducting the odor evaluation tests with these facilities are also presented, along with the design of test programs and statistical analysis of the resulting test data. Appendices describe the theoretical basis for air purification requirements in test chambers, the composition and makeup of diesel odor standards, and mathematical derivations of the statistical procedures. (Author abstract modified)
APTIC-18231

CHARACTERISTICS OF PARTICULATE PATTERNS 1957-1966.

For primary bibliographic entry see Field 04.
APTIC-18232

ELECTRONIC TECHNIQUES FOR PARTICLE SIZE ANALYSIS.

Minerals Process., 10 (6):16-21, June 1969. 3 refs.
R. G. Blezard, and R. W. Pring.
Identifiers: *Cements, *Sieve analysis, Great britain, Particulates, Particle counters, Particulate classifiers, Particle size, Calibration methods.

The Coulter counter, combined with sieve analysis, has proved to be reliable in determining the particle size distribution of cement raw mixes and cement clinker grinding, providing a high degree of reproducibility between duplicate determination. The electronic approach has revealed significant differences in the particle size distribution in cements and prepared raw materials, particularly where different types of mills are used. Satisfactory results are obtained if the correct choice of electrolyte composition, particle concentration, and instrument settings is made. A 2% solution of lithium chloride in methanol was the best electrolyte. Preparation of the sample for Coulter counter analysis consisted of weighing 10 mg of wet slurry on a microscope slide and adding one drop of Nonidet P 42 solution to assist in mixing the sample. Size analysis was determined using a 200 and a 50 micron tube.
APTIC-18236

PARTICLE SIZE ANALYSIS IN THE SUBMICRON RANGE.

Control Instrumentation, 1 (1):63, 65, May 1969.
Personal Author Not Recorded.

Identifiers: *Particle size, Analytical methods, Particulate classifiers, Centrifugal separators.

Only two practical methods for precise size determinations in the sub-micron range are available. One is the electron microscope and the other is the Joyce-Loebl disc centrifuge. The electron microscope gives accurate measurement of individual particles, but due to its slow operating speed, sampling problems, and its vulnerability to human error, it is unsuitable for analyzing a range of sizes. The disc-centrifuge is based on the principal of centrifugal sedimentation. A hollow perspex disc, rotating about a horizontal axis, is partially filled with the sedimentation medium, and a suspension of the particles to be measured is introduced into the rotating tank. At some time after addition of the suspension, a sample of fluid is extracted at a known radius from the disc. The total weight of particles present in this sample may be ascertained by standard analytical procedures. By taking a series of such samples collected after differing centrifugal forces, it is possible to obtain a particle size distribution. The upper limit of particle size which can be determined in this way is approximately 30 micrometers, and there is no theoretical lower limit.
APTIC-18238

ON PERFORMANCE OF A DIFFUSION CELL FOR PREPARATION OF AIR FLOW CONTAINING LOW CONCENTRATION OF ORGANIC VAPOR.

Ind. Health, 6 (3):120-127, Oct. 1968. 10 refs.
Heihachiro Arito, and Reisuke Soda.
Identifiers: *Diffusion cell, Toxicity, Japan, Collectors, Experimental equipment, Diffusion.

A simple diffusion cell was examined for its applicability in routine use as a generator of air flow containing low concentrations of organic vapor. Both the fluctuation of concentration of vapor in the air flow and the ratio of the time-averaged concentration to the calculated one were observed by gas chromatography at short sampling intervals for two or more hours. High fluctuations in the concentration in steady state operation was noticed beyond certain operational conditions and structural factors of the cell. Fluctuations were found at high flow rates of air with small diameter diffusion tubes, where large differences in room and bath temperature occurred, and when small diameter diffusion tubes were used. An attempt to reduce the fluctuation was made. Buffer flasks were found to absorb it effectively. The time-averaged concentrations from 0.4 to 82 ppm were in good agreement with calculated values. The diffusion cell can be applied to studies such as experiments on inhalation of toxic vapors by animals, human olfactory perception of organic vapors, and measurement of collection efficiency of vapors where low constant concentrations are required.
APTIC-18257

COLOR REACTION WITH CARBAZOLE, INDOLE, PYRROLE AND SOME OF THEIR DERIVATIVES WITH BROM-NITROINDANDEIONE.

(Tsvetnye reaktsii karbazola, indola, pirrola i nekotorykh ikh proizvodnykh c bromnitroindandionom). Zh. Analit. Khim. (Moscow), 9 (4):217-219, 1954. 1 ref. Translated from Russian. Belov and Associates, Denver, Colo., 5p., April 15, 1970.
G. Vanag.
Identifiers: *Colorimetry, *Organic nitrogen compounds, *Chemical reactions, *Brom-nitroindandeione, Ussr, Acetic acid, Brominated hydrocarbons, Carbazoles.

A study was conducted to clarify the selective action and sensitivity of the reaction between carbazole and 2-brom-2-nitroindandeione-1,3. A carbazole solution in a glacial acetic acid medium produces an intensive red color with 2-brom-2-nitroindandeione-1,3. The color intensity depends on the carbazole concentration, the quantity of brom-nitroindandeione, and the duration of heating. Many other solvents were studied besides glacial acetic acid. Isoamyl alcohol with brom-nitroindandeione produced a red color. No red color was obtained with 3-nitrocarbazole or 3,6-dinitrocarbazole. Indole produces a red color, in the absence of carbazole, without heating. Pyrrole produces a red-violet coloring with brom-nitroindandeione in a glacial acetic acid medium with heating. The coloring reactions of many other amino acids were also investigated. It is concluded that 2-brom-2-nitroindandeione in a glacial acetic acid solution produces a characteristic coloring with many compounds containing pyrrole rings.
APTIC-19645

DETERMINATION AND ESTIMATION OF THE VARIABILITY OF RESULTS OF MEASUREMENTS AND TESTS.

(Ermittlung und Beurteilung der Variabilitaet von Mess-und Beobachtungsergebnissen). Text in German. Arch. Hyg. Bakteriol. (Munich), 150 (5):418-436, 1967. 15 refs.
E. Effenberger.
Identifiers: *Variability, *Measurement methods, *Data analysis, *Statistical analyses, Carboxyhemoglobin, Germany, Dusts, Colorimetry, Carbon monoxide.

Measurement and test results are frequently being discussed without indicating the error margin which might lead to misinterpretation. With the aid of statistic, the variability of measured data can be analyzed and the random errors causing the variability found. The variability of measuring results may be due to the person taking the measurement, e.g., instrument reading error, the measuring instrument, or both. Due to temperature changes, voltage fluctuations, aging of the unit, etc., different results might be obtained. Determination of the causes for random measurement errors is demonstrated with results from dust fall measurements on adhesive foil, carbon monoxide measurements, CO-Hb measurements of the blood by the Wolff method, and measurements of the cyanide content of groundwater. The standard deviations of measurement results is broken down into individual components by variance analysis. In the colorimetric determination of CO in blood, the variability between samples is far larger than error introduced by visual color comparison. In measurements of the CO concentration in air, the variability increases with increasing CO concentration.
APTIC-19734

MEASUREMENTS OF AEROSOLS BY HOT WIRE ANEMOMETRY.

Maryland Univ., College Park, Dept. of Aerospace Engineering, Proc. Intern. Symp. Hot Wire Anemometry, College Park, Md., 1967, p. 134-152. 7 refs. (March 20-21.) CFSTI, DDC: AD 676019
Victor W. Goldschmidt, and Michael K. Householder.
Identifiers: *Aerosols, *Particle size, *Anemometers, Design criteria, Turbulence (atmospheric).

A hot-wire anemometer was modifed for measuring aerosol size distribution and concentration in turbulent flows. The sampler circuit includes an electronic filter, amplifier, amplitude triggering device, and an electronic counter. The cooling signal due to particle impaction is analyzed with respect to amplitude and frequency distribution. A linear relationship between particle size and cooling signal peak value is found by two different methods and verified. Even though the results are not completely unquestionable, the system lends itself to the determination of aerosol concentration, size distribution, and impaction coefficients on the hot-filament collector. (Author abstract)
APTIC-19735

WAVEFRONT RECONSTRUCTION AND ITS APPLICATION TO THE STUDY OF THE OPTICAL PROPERTIES OF ATMOSPHERIC AEROSOLS.

Aerospace Corp., El Segundo, Calif., Electronics Research Lab., Rept. ATR-69 (8103)-1, 109p., July 31, 1969. 61 refs. CFSTI: N69-38131
George C. Sherman.
Identifiers: *Holography, *Optical properties, *Wavefront reconstruction, *Aerosols, Measurement methods, Particle shape, Particle size, Mathematical analyses, Light scattering, Diffraction.

A theory is developed for optical wavefront reconstruction in a manner appropriate for the application of holography to the study of the optical properties of atmospheric aerosols. The theory is developed under simplifying assumptions by applying Rayleigh's integral formula and the angular spectrum of plane waves to treat relevant diffraction problems. The theory satisfactorily describes experimental data for all diffraction angles and explicitly displays the effects introduced in the reconstruction process by the attenuation of the inhomogeneous waves in the angular spectrum of the diffracted wave. The attenuation causes a loss of resolution that is especially important in the images of aerosol particles of dimensions smaller than the wavelength. A perfect, three-dimensional real image of a wave field is obtained from the hologram only if the wave field belongs to the class of 'source-free waves.' These waves are of fundamental importance in the fields of imaging and diffraction by planar screens. Two new diffraction formulas are derived and are absolutely and uniformly convergent for an extended class of wave fields that includes source-free wave fields. The formulas are a series mode expansion and a series that describes the contribution to the wave field due to each partial derivative of the boundary value. From these series two angular spectrum of plane-waves representations are derived for wave fields in the extended class. The angular spectrum of plane waves is then used to develop an integral-transform formulation of diffraction theory without employing the paraxial approximation required by previous authors. The theory of generalized functions is used to generalize the angular spectrum of plane waves. The generalization yields equations that permit treatment of boundary values that cannot be treated by classical diffraction formulas. Holographic techniques are discussed that permit, without disturbing the aerosol, measurement of size, shape, and scattering matrices of individual particles suspended in an aerosol. (Author abstract modified)
APTIC-19739

SOME LABORATORY AND FIELD INVESTIGATIONS OF THE ACCURACY OF BREWER-MAST OZONE SENSORS.

Centre National de la Recherche Scientifique, Paris (France), Proc. Symp. Ozone Atmospherique, Monaco, 1968, p. 143-147. 4 refs. (Sept. 2-7.) CFSTI: N70-16625
D. B. B. Powell, and E. L. Simmons.
Identifiers: *Ozonesondes, Great britain, Spectrophotometry, Calibration methods, Design criteria, Simulation, Ozone.

An attempt was made to discover the reason for the persistent difference between the integrated amount of ozone obtained in ozone sounding and the total ozone measured by the Dobson ozone spectrophotometer, and for the variations in this difference. A laboratory apparatus for flight simulation was devised, in which ozone and air are admitted to a bell-jar which can be pumped down to pressures of 5 mb. The rate of flow of a rich ozone-oxygen mixture into the bell-jar is kept constant while the amount of air is adjusted to keep the partial pressure roughly constant. Larger variations of sensitivity were found than can be explained by the changes in the pumping rate, measured in a separate experiment. Field measurements were also made, during which Brewer-Mast and Komhyr ozone sensors were flown together, and in which two Brewer-Mast sensors were connected in cascade in one sonde and telemetered

separately. Results indicate that the response of Brewer-Mast ozone sensors is variable with height, and this variation persists even if correction is made for the individual variation of the pumping rate with height, although the behavior of a particular bubbler is consistent within the required accuracy. Possibilities for improved equipment design are discussed. (Author abstract modified)
APTIC-19749

FREEZE-DRYING IN THE RECOVERY OF ORGANIC MATERIAL FROM EXTRACTS OF AIR PARTICULATES.

Preprint, National Air Pollution Control
Administration, Cincinnati, Ohio, Div. of
Chemistry and Physics, 25p., 1970. 8 refs.
Eva Wittgenstein, Eugene Sawicki, and Roger L.
Antonelli.
Identifiers: *Freeze-drying, *Particulates, *Solvents, Hydrocarbons, Benzenes, Drying, Freezing.

Results of a preliminary study are reported showing that freeze-drying may be used advantageously to evaporate aqueous, aqueous organic, or organic solvents from extracts obtained from airborne particulates. The simple freeze-drying unit used in the study was made, except for two adaptors, from components available in most laboratories, and can be used to dry a number of samples of various sizes simultaneously. The method requires less time than drying at 50 C in a conventional vacuum oven, and is often the only method of evaporation that can be used without resorting to elevated temperatures for prolonged periods of time. Since the evaporation is conducted below room temperature, the danger of damaging sensitive organic components is reduced. An added advantage is that practically no solvent vapor is dispensed into the atmosphere - it is trapped in a supercooled flask. Several solvents, including benzene, cyclohexane (B.P. 80.7 C), and N,N-dimathylformamide (B.P. 153 C) were used to extract airborne particulates obtained from various sources of air pollution. Methods of collecting organic material are compared; recovery time, yield, solubility, and the chemical and spectral properties of the dried material are criteria of the efficiency, simplicity, and practicality of the freeze-drying method. (Author abstract modified)
APTIC-19752

A SIMPLE CARBON DIOXIDE ANALYZER.

Preprint, Air Pollution Control Association, New
York City, 5p., 1962. 1 ref. (Presented at the Air
Pollution Control Association Annual Meeting,
55th, Chicago, Illinois, May 24, 1962, Paper 62-22.)
James P. Lodge Jr., Evelyn R. Frank, and Helen
A. Huitt.
Identifiers: *Continuous monitoring, *Carbon dioxide, Costs, Electrochemical methods, Measurement methods, Instrumentation, Ph.

A improved laboratory version of a continuous carbon dioxide analyzer based on the measurement of pH in an aerated suspension of calcium carbonate is described. This analyzer is built around a Beckman 76 pH meter and Beckman automatic temperature compensator, and provides a sensitivity of 1 ppm CO2. Cost of the assembled instrument is estimated at less than $1000, exclusive of recorder. This modified design of previously developed instrument eliminates two principal errors in the original instrument: long-term drift off base-line, and temperature sensitivity. A full calibration of the instrument has not yet been performed; however, there is no evidence to indicate that the slope of the calibration curve will be greatly different from that previously published.
APTIC-19753

SURVEY OF TECHNIQUES EMPLOYED TO DEFINE AEROSOL 'RESPIRABLE DUST' CONCENTRATION AND PARTICLE SIZE CHARACTERISTICS.

California Univ., Los Alamos Scientific Lab., N.
Mex., AEC Contract W-7405-ENG. 36, 12p., Nov.
21, 1969. 21 refs. CFSTI: LA-4249
Harry J. Ettinger.
Identifiers: *Deposition, *Sampling methods, Standards, Maximum allowable concentration, Respiratory system, Aerosols, Dusts, Suspended particulates, Particle size, Samplers.

A survey was carried out by the Los Alamos Scientific Laboratory to determine what air sampling procedures are currently used to evaluate the hazard due to inhalation of toxic particulates at U. S. Atomic Energy Commission contractor facilities. Ninety-five pzercent of the facilities use air sampling to evaluate potential health hazards. Less than 25% of the facilities use two-stage cyclone samplers to estimate 'respirable' dust concentrations, and half of these operate the cyclones at the wrong flow rate. Approximately 50% of the facilities do limited sampling for particle size analysis. A wide variety of methods are employed, and there is no specific relationship between the particle sizes determined by different methods. Sampling for 'respirable' dust and particle size analysis is limited to special problems. Many particle size sampling methods do not determine aerodynamic diameter which is the parameter of concern when estimating lung deposition. Only one facility adjusts its maximum allowable air concentration to compensate for the presence of a 'respirable' dust concentration higher than that assumed by the Internation Commission on Radiological Protection. Over 80% of the facilities report that more air sampling should include the determination of 'respirable' dust fraction or particle size analysis. Standardized air sampling procedures to determine 'respirable' dust concentration and particle size analysis should be adopted by AEC contractor facilities. To help implement standard procedures, a 'Manual of Recommended Procedures' and short course training should be developed within the AEC.
APTIC-19756

DEVELOPMENT OF A MULTISTAGE INERTIAL IMPACTOR.

Union Carbide Corp., Oak Ridge, Tenn.,
Subcontract 2799, 22p., Oct. 1967. 12 refs.
A. R. McFarland, and R. B. Husar.
Identifiers: *Aerosols, *Cascade samplers, Particle size, Design criteria.

A cascade impactor aerosol collector designed to characterize reactor-accident type aerosols, is described. The device has four impactor stages and an after-filter. Multiple jets, which are employed in the 2nd, 3rd, and 4th stages, permit the collection of small particles at relatively low jet velocities. The design sampling rate is 6.25 liters/minute. When used in conjunction with metal oxide particles of density 4 gm/cu cm, the cutpoints of the four stages are: 2.6, 1.1, 0.4 and 0.16 micron diameter. To facilitate disassembly and analysis in hostile environments, each impaction stage consists of only two parts, the jet plate and the impactor plate, which can be disassembled by remote manipulaters. Design criteria and experimental verification of impactor performance are included. (Author abstract modified)
APTIC-19768

THE USE OF A DYNAMIC DILUTION SYSTEM IN THE CONDITIONING OF STACK GASES FOR AUTOMATED ANALYSIS BY A MOBILE SAMPLING VAN.

Preprint, Air Pollution Control Association, New
York City, 13p., 1970. 4 refs. (Presented at the Air
Pollution Control Association, Annual Meeting,
63rd, St. Louis, Mo., June 14-19, 1970, Paper 70-
36.)
Kenneth W. Grimley Jr., Walter S. Smith, and
Robert M. Martin.
Identifiers: *Dilution, *Samplers, *Stack sampling, Mobile, Stack gases, Suspended particulates, Fumes, Automatic methods, Continuous monitoring, Gas sampling, Humidity.

A system which conditions stack gases in order to make them acceptable for automated analysis by a mobile sampling van is described. The term 'sample conditioning' refers to the process by which the stack gas is rendered acceptable for analysis. Normally this would include only the removal of moisture and particulates from the sample. The dynamic serial dilution system's design was governed by the neeed to selectively and continuously identify various gaseous pollutants with instruments the analytical capabilities of which are limited to concentrations more typically encountered in ambient air. This situation meant that some means of diluting the stack gas would be needed. Since dilution with dry air would lower the moisture content, the system keeps the sample above its dew point until after dilution, thus solving the moisture problem. The system includes both coarse and fine fiters for particulate removal. The stack gases can be diluted to six different integral powers of ten. Most sources require no more than the first two or three stages. Other applications of the system are discussed, along with the various advantages it displays.
APTIC-19777

EFFECT OF ATMOSPHERIC PARAMETERS ON THE CHEMI-LUMINESCENT OZONE SYSTEM. (FINAL REPORT).

Parametrics Inc., Waltham, Mass., OAR Contract
AF 19 (628)315, 37p., Nov. 26, 1962. 9 refs.
CFSTI, DDC: AD 684700
L. Seiden, P. Scheurer, D. Chieck, and O.
Cucchiara.
Identifiers: *Ozonesondes, *Atmospheric phenomena, *Chemiluminescence, Operating variables, Balloons, Altitude, Middle atmosphere, Meteorology, Humidity, Pressure (atmospheric), Temperature (atmospheric), Ozone, Flow rates, Reaction mechanisms.

The parameters of the chemiluminescence reaction of ozone with rhodamine B dye adsorbed on silica gel were quantitatively evaluated under simulated flight conditions, for application to a system of balloon flight soundings as an inexpensive and reliable method of measuring atmospheric ozone. During a balloon flight, air is drawn by a pump over the chemical detector. The light output is measured and amplified by a photomultiplier tube to give a voltage signal which is radioed back to earth. The effects of the following parameters on the signal output were investigated: preparative methods for chemiluminescent discs of rhodamine B dye adsorbed on silica gel; activation effects when the discs are exposed to ozone; humidity effects; pressure, concentration, and flow rate dependencies; temperature dependence; photomultiplier tube-dye efficiency; and mechanism of the ozone chemiluminescence reaction. Results are given, and show that the requisitive sensitivities and speed of response are easily obtained. The effects of atmospheric temperature, humidity, gas density, etc. can easily be corrected for or eliminated, and it is concluded that the reaction system is well suited for the purpose of a balloon-borne ozone sonde.
APTIC-19791

CARBON DIOXIDE IN AIR.

National Bureau of Standards, Washington, D. C.,
Microchemical Analysis Section, TN-505, p. 12,
Oct. 1969.
Personal Author Not Recorded.
Identifiers: *Flame ionization detector, *Carbon dioxide, Methanes, Carbon monoxide, Catalysis.

Developmental work is in progress on a method for determining atmospheric carbon monoxide and carbon dioxide based on the catalytic conversion of these compounds to methane, with subsequent determination of the methane using a flame ionization detector. The method is expected to be applicable to the determination of the 'zero' level of

CO2 in the gases used to prepare the standard CO2 mixture.
APTIC-19797

SPECTRAL METHOD OF DETECTING AEROSOLS OF LEAD, ARSENIC, AND ZINC IN AIR OF INDUSTRIAL PREMISES.

(Spektral'nyy metod opredeleniya aerozoley svintsa mysh'yaka i tsinka v vozdukhe promyshlennykh pomeshcheniy). Text in Russian. Nauch. Rab. Inst. Okhr. Tr. Vses. Tsent. Sov. Prof. Soyuzov, no. 48:77-82, 1967. 8 refs.
K. G. Chernousova.
Identifiers: *Lead, *Zinc, *Spectrometry, *Arsenic compounds, Ussr, Aerosols.

A method for simultaneous detection of lead, arsenic, and zinc to a relative accuracy of plus or minus 12% using a single instrument was developed. Zinc can be detected at the 3345.06 A line with the presence of as much as 0.5% calcium in the sample. Determinations of lead, arsenic, and zinc are not prevented by the presence of iron or copper in amounts of up to 1%, or magnesium up to 0.5%.
APTIC-19857

A SIMPLE THIN-LAYER-CHROMATOGRAPHIC METHOD FOR THE DETERMINATION OF CARCINOGENIC BENZO (A)PYRENE IN AIR PARTICULATES.

(Eine einfache duennschichtchromatographische Methode als Beitrag zur Bestimmung des kanzerogenen Benzo (a)Pyrens in Schwebstoffen). Text in German. Fraunhofer-Gesellschaft, Garmisch-Partenkirchen (West Germany), Physikalisch-Bioklimatische Forschungsstelle Wiss. Mitt. 5, 47p., March 1970. 26 refs.
Ute Pfetsch, and Karl Poetzl.
Identifiers: *Particulates, *Thin-layer chromatography, *Benzopyrenes, Carcinogens, Germany.

A simple method for estimating cancerogenic benzo (a)pyrene (BaP) in airborne particulates is described. The method consists of three steps: (1) extraction of air samples, collected on filter disks by a small volume of solvent in a special reflux-condenser system (cold finger condenser); (2) thin-layer chromatographic separation of the BaP by triplicate run on a silica gel G thin-layer plate and cyclohexane-pyridine (95 plus 5) as developer; and (3) fluorimetric determination of the BaP-concentration in the eluate obtained by peeling the BaP-zone from the plate, extracting it with a known volume of acetone by shaking and sedimentation of the silica gel. The lowest detectable BaP-concentration is about 0.05 gamma/ml. The recovery is nearly complete and the maximum deviation from the mean does not exceed plus or minus 10 per cent. The time needed for the analysis is short and only a small amount of reagents is required. Some data on the analysis of test mixtures and different typical industrial aerosol samples are given to demonstrate the effectivness and accuracy of the method as described. (Author abstract)
APTIC-19884

INSTRUMENTS FOR MEASURING MICRO-CLIMATE AND DUST EXHIBITED AT THE INTERNATIONAL FAIR TRADE IN BRNO.

(Pristroje pro mereni mikroklimatu a prasnosti na mezinarodnich brnenskych veletrzich). Text in Czech. Pracovni Lekar. (Prague), 20 (6):255-256, 1968. 4 refs.
Ivan Berka.
Identifiers: *Dusts, *Measurement methods, *Meteorology, Czechoslovakia, Particle size, Winds, Humidity, Micrometeorology, Temperature (atmospheric).

A comparative survey of instruments for measuring micro-climate and dust exhibited at the International Trade Fair in Brno is presented. TVR/03 is a portable instrument for measuring temperature, relative humidity, and the speed of wind in mines. With the aid of abacus, it is possible to evaluate the cooling effect from read figures. The ranges of the instrument are 0 to 20 C, and 20 to 40 C with relative a precision of plus or minus 2%; 30 to 100% relative humidity with relative a precision of plus or minus 3%; and for wind speed from 0.1 to 12 m/sec with the average maximum error of 5%. The Hydrophil and Thermophil, manufactured by Ultrankunst - Germany measure relative humidity and temperature of the air on the surface of objects. The readings from several instruments located in different places are centrally recorded. Firm C F Cassella-England exhibited thermohydrograf and thermograf enecometers. Other products were apparatuses for measuring dust particles at 112 A and 113 A.
APTIC-19938

AIR POLLUTION SURVEY PROBLEMS DUE TO NOXIOUS IMMISSIONS.

Preprint, Warren Spring Lab., Stevenage, U. K., Dept. of Scientific and Industrial Research, 7p., 1962. (Presented at the Symposium on Air Pollution Surveys, Stevenage, England, Nov. 1962.)
H. Stratmann.
Identifiers: *Research methodologies, *Survey methods, Germany, Data analysis.

An air pollution measurement program must provide information to the determination and the critical examination of emissions themselves with respect to their possible oppressive or harmful effect, the source of specific emissions and their meteorological aspects, and the extent to which a certain industry contributes to the emission of its surroundings. The level of concentration in the area of an object at risk is different from the concentration of any contaminant on release from its source. Measurements at one site must be distinguished from measurements to determine the level of concentration in a certain area, as the concentrations vary only with time at one site while over an area they also vary in space. If the integral of the fluctuations of the concentration with time is found for a continuous set of measurements, the mean represents the real mean of the population in question, and the size of random sample to give a representative sample becomes important. According to biological investigations, the peak concentrations and periods of respite are often more important than the mean over a longer period. The standard deviation of the individual values from the mean suggests itself as a characteristic parameter. The further question arises as to what is the distance necessary between two sites for measurements at each site to differ from each other, and to what extent can the number of measuring sites be reduced and still give the same results. Samples taken at random were found to give the characteristic parameters of emissions as reliably as did the recording instrument, and a sulfur dioxide measurement program was reduced to one sampling site with a recording instrument and 20 selected sites for intermittent measurement.
APTIC-19942

STUDY OF GAS PHASE CHEMICAL REACTIONS BY INFRA-RED SCAN MONOCHROMATOR.

Kagaku no Ryoiki (J. Japan. Chem.), 23 (2): 12-17, 1969. 10 refs. Translated from Japanese. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 18p., May 14, 1969.
Isamu C. Hisatsune.
Identifiers: *Infra-red monochromator, Measurement methods, Spectrometry, Nitric oxide (no), Chemical reactions, Infrared radiation, Gases, Reaction mechanisms.

The operating principles and applications of the infra-red rapid scan monochromator are described, particularly in its application to the gas phase reaction of nitrogen oxide. A monochromator of the type described can repeatedly record 3-150 spectra per second. It performs most satisfactorily measuring reactions of short half-life time, in the range from 1-60 seconds. Two slightly different units are described; one is commercially available, the other is an experimental device. A reaction cell for mixing the reactants to be studied is described. Several sample reactions are analyzed to serve as examples of the abilities of the method.
APTIC-19958

THE POSSIBILITY OF INTERPRETING THE DATA OF A SEDIMENTATION ANALYSIS.

Probl. Fiz. Atm., no. 5, 1967. 6 refs. Translated from Russian. Aztec School of Languages, Inc., McLean, Va., Research Translation Div., p. 261-264, 1970. CFSTI: NASA TT F-587
M. M. Kokhanovich, and V. G. Morachevskiy.
Identifiers: *Particle size, *Sedimentation, *Photographic methods, Ussr, Droplets, Particulate sampling.

The results of a parallel study of the size distribution of drops of a modeled nebula are presented. The information is obtained by a sedimentation analysis and by the microphotographic method in order to illustrate the advantages of the former. The sedimentation method of analyzing the degree of dispersion of a modeled nebula gives a completely clear and precise representation of the size distribution of the drops in it. It can be used to study natural and modeled clouds and nebulae, and is less cumbersome than the microphotographic method. (Author abstract modified)
APTIC-19960

THE ARL AUTOMOTIVE-POLLUTION PROJECT.

Trend Eng. Univ. Wash., 22 (1):5-10, 22, Jan. 1970. 22 refs.
J. M. Willenberg, and R. C. Corlett.
Identifiers: *Nitric oxide (no), *Shock-tube technique, *Gas sampling, *Engine exhausts, Combustion gases, Internal combustion engines, Test engines.

The shock-tube is a gas filled tube consisting of a high-pressure and a low-pressure section, separated by a diaphragm. After the diaphragm is broken, a shock wave propagates through the driven gas, suddenly raising the temperature and pressure of the gas in the test section. A shock-tube technique is being developed for investigating the over-all kinetics of nitric oxide production under physical conditions typical of automobile-engine cylinders. The connection between this project and the total problem of air pollution by automobiles is discussed, and the relation of the shock-tube approach to the study of NO kinetics and to other methods, such as the use of test engines, is outlined. Accurate measurement of NO concentration in high-speed processes accompanied by combustion products is troublesome. A novel shock-tube end-wall sampling system, especially developed for the purpose, is described. (Author abstract modified)
APTIC-19971

METHODS OF ANALYSIS OF POLLUTED ATMOSPHERES IN THE U. S.

Intern. J. Air Water Pollution (London), vol. 7:79-90 1963. 54 refs.
James P. Lodge Jr., Charles Xinteras, John B. Pate, and A. P. Altshuller.
Identifiers: *Measurement methods, Soiling index, Flame ionization detector, Saltzman method, West and gaeke, Lead peroxide candle, Photometric methods, Hydrocarbons, Polynuclear compounds, Nitrogen dioxide (no2), Sulfur dioxide, Sulfur trioxide.

A series of articles on methods of analysis of polluted atmospheres is presented. Methods for measuring soiling potential are generally done on paper tape samplers. Sulfur dioxide can be monitored with absorption or titration devices, can be measured cumulatively by the lead peroxide method, or can be checked on a short-term basis by the West-Gaeke method. There is no satisfactory

specific method for measuring sulfur trioxide. The Saltzman method of measuring nitrogen dioxide is most commonly used, followed by the Jacobs method. Hydrocarbon measurement methods include thermal conductivity, infrared methods, flame ionization methods, and gas chromatography. The method of choice for the determination of polynuclear hydrocarbons is that of Sawicki.
APTIC-19981

ATMOSPHERIC SALT PARTICLES AND RAINDROPS.

For primary bibliographic entry see Field 05.
APTIC-19991

POLAROGRAPHIC PROPERTIES OF SMOG AEROSOLS.

Intern. J. Air Pollution, vol. 2:283-290, 1960. [illegible] refs.
H. Mayrsohn, and P. P. Mader.
Identifiers: *Aerosols, *Smog, *Polarographic methods, Engine exhausts, Olefins, Nitrogen oxides.

Based upon observations that atmospheric aerosols collected on filter papers exhibited oxidant properties, it seemed reasonable to expect that these aerosols would be electro-reducible, hence capable of rapid and precise analysis with the polarograph and dropping mercury electrode. Under experimental polarographic conditions, atmospheric aerosols yielded a simple, stable and consistent voltage pattern consisting of not more than two half-wave potential values, regardless of the geographical source of the sample. One wave was identified as due to lead ions. The second wave which was always present in samples taken during smog episodes, was not definitely identified, but is apparently associated with oxides of nitrogen-olefin reaction products. The aerosols resulting from automobile exhaust yielded polarograms strikingly similar to atmospheric aerosols, and the resultant diffusion current was a function of the olefin content of the original fuel. (Author abstract modified)
APTIC-19992

IMPROVED N C B APPARATUS FOR MEASURING FLUE GAS DUST CONCENTRATIONS.

Steam Heating Eng. (London), 39 (459):12-15, Feb. 1970.
Personal Author Not Recorded.
Identifiers: *Sampling probes, *Stack sampling, *Design criteria, Great britain, Stack gases, Dusts, Boilers.

Most techniques for measuring grit and dust concentrations in flue gases rely on the use of a filter to remove all or part of the burden of solids. Drawbacks include the need to continually adjust the suction on the probe in the gas stream to compensate for increased filter resistance and the need for powerful suction equipment to overcome the high pressure drop through the equipment. A new probe design overcomes these problems by dispensing with the filter and utilizing a small high-efficiency, tangential flow cyclone carried within the probe head. The probe and its associated pilot tube (for velocity profile measurements) are designed for insertion through a 50 mm hole in a stack or duct carrying flue gases. The equipment, which is suitable for use in gas temperatures up to 400 C, is primarily intended for measuring grit and dust emission from a coal-fired boiler plant. The stainless-steel sampling probe comprises an inlet nozzle from which flue gas are led to a miniature cyclone with removable hopper. Gas is drawn through the probe by a fan. The simplicity of the apparatus permits samples to be taken from a maximum number of positions without a corresponding increase in test time. Following a test, the cyclone hopper is removed, and solids surrounding the cyclone are brushed into the hopper. The material is dried at 105-110 C until all moisture has been driven off. The material is then weighed and the solids emission determined.
APTIC-20256

DECREE OF THE PRESIDENT OF THE (ITALIAN) REPUBLIC, OCTOBER 24, 1967, NO. 1288; REGULATION FOR ENFORCEMENT OF THE LAW OF JULY 13, 1966, NO. 615, CONTAINING MEASURES AGAINST AIR POLLUTION ORIGINATING FROM HEATING PLANTS; APPENDIXES 8 AND 9.

(Decreto del Presidente della Repubblica, 24 Ottobre 1967, n. 1288; Regolamento per l'esecuzione della legge 13 luglio 1966, n. 615, recente provvedimenti contro l' inquinamento atmosferico limitamente al Settore degli impianti termici. Appendice). Text in Italian. Ing. Sanit., 16 (3):207-216, May-June 1968.
Personal Author Not Recorded.
Identifiers: *Italy, *Fuel oils, *Measurement methods, *Sulfur compounds, *Regulations, Distillate oils, Residual oils, Kerosene, Analytical methods, Flow rates, Ph, Federal governments, Legislation.

Appendix 8 gives instructions for determining the sulfur content of liquid fuels distilled from petroleum (kerosene and gas oil) and of fuel oils derived from petroleum. Appendix 9 gives instructions for determining the visosity of liquid fuels. The distilled fuel sample is burned in a special lamp in a controlled atmosphere of CO2 and O2. The sulfur is oxidized and converted to the sulfate ion, which is volumetrically determined with a standard solution of sodium hydroxide. Fuel-oil sulfur is determined by a measurement of the acidity of the combustion products of the sample, which are collected in a quartz tube at temperatures of 950-1,000 C. Viscosity is determined by measuring the time required for a given volume of liquid at a temperature of 50 C to cross a capillary tube, unaided by any other force except gravity. Viscosity is measured in Stokes and centistokes. A table is given for the conversion of visosity in Stokes to Engler units.
APTIC-20357

COMPARATIVE EFFECTIVENESS OF SOME EQUIPMENT AND METHODS OF MEASURING LOW CONCENTRATIONS OF OZONE.

Plant Disease Reptr., 46 (3):137-139, March 15, 1962. 6 refs.
Gustave Silber.
Identifiers: *Impingers, *Ozone, *Evaluation.

Test tube-type gas impingers fitted with an intake of 1-mm capillary bore tubing or a fritted glass cylinder dispersion tube were compared for their effectiveness of ozone recovery. Impingers of 1-mm capillary tube recovered 14 to 30% more ozone than did fritted glass-tube impingers. Ozone concentration of atmosphere was secured simultaneously by a commercially available ozone meter and by chemical analysis, using neutral buffered potassium iodide solution as the collecting medium in blackened test tube impingers fitted with a 1-mm capillary bore intake. Meter readings were lower and ranged from 55 to almost 83% of values determined by chemical analysis. (Author abstract)
APTIC-20396

ULTRAVIOLET ABSORPTION FOR SO2 STACK MONITOR.

(Shigaisen kyushuho ni yoru aryusan gasu sokuteiho ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4 (1):25, 1969. (Proceedings of the 10th Annual Meeting of the Japan Society of Air Pollution, 1969.)
T. Kimoto, and M. Sakauchi.
Identifiers: *Stack sampling, *Ultraviolet spectrometry, *Sulfur dioxide, Japan, Measurement methods, Design criteria, Formaldehydes, Ammonia, Bromine compounds, Fluorine compounds, Benzenes, Acetone, Carbon dioxide, Nitrogen dioxide (no2), Hydrogen sulfide.

An exposition is presented of a high-concentration sulfur dioxide monitoring device that can also be applied toward environmental air quality measurements. The apparatus essentially depends on the absorption of ultraviolet light by sulfur dioxide at the wavelengths in the range of 280 to 305 millimicrons where there is a large depression in the absorption spectra. The specification of the device as well as the diagram of the electrical connections of various components are presented. By changing the wavelength specification of the device, other gases such as nitrogen dioxide, hydrogen sulfide, acetone, benzen, ammonia, fluorine, chlorine, bromine, and methylformaldehyde can be measured. The test run showed that there was little interference from substances such as nitrogen dioxide, steam, and carbon dioxide; the linearity of the concentration versus the meter swing was good. The zero-span drift was minimal and the response speed was around 90% in a minute interval, depending on the flow rate.
APTIC-20650

CALIBRATION OF NO2-AUTOMETER USING PERMEATION TUBES.

(Permeation tube ni yoru NO2 jidokiro kukei no kosei ni kansuru kenkyu). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4 (1):43, 1969. (Proceedings of the 10th Annual Meeting of the Japan Society Air Pollution, 1969.)
M. Terabe, S. Yamada, and S. Sato.
Identifiers: *Measurement methods, *Calibration methods, *Nitrogen dioxide (no2), Japan, Nitric oxide (no).

Low-concentration nitrogen dioxide gas from an NO2 permeation tube was used to calibrate an NO2-autometer by comparing its values with the Saltzman method. The mechanical connection of the entire system of permeation tube production of nitrogen dioxide is presented. The gas was analyzed by Saltzman method as well as the autometer and the results were compared to the values calculated from the decrease in weight of the tubes; the two values for tube No. 1 and tube No.2 are presented. The autometer measurement from the first tube was about 90.3% of the calculated value, and the first tube and the second tube (for NO) together yielded 131.5% of the calculated value, implying that in measuring nitric oxide in tube No. 2, the leftover nitrogen dioxide from tube No.1 was added on. With the problem of NO to NO2 oxidation, there are more studies necessary on measurements by autometers.
APTIC-20651

THE ESTIMATION OF FIREDAMP: APPLICATIONS AND LIMITATIONS. OF THE PELLISTOR.

Mining Engr. (London), 128 (100):237-244, Jan. 1969. 12 refs. (Presented at The Southern Counties Institute of Mining Engineers, Colloquium on Firedamp Measurement and Control, Isleworth, England, May 3, 1968, Paper 4267.)
A. R. Baker, and J. G. Firth.
Identifiers: *Firedamp, *Pellistor, Great britain, Coal, Mining, Automatic methods, Catalytic oxidation, Methanes.

An important factor for the control of the firedamp hazard in coal mines is the provision of suitable instruments for the quantitative assessment of firedamp. The major flammable component in firedamp is methane. Most modern instruments for the measurement of firedamp concentrations in the range of 0 to 5% are based on catalytic oxidation. The flammable gas is oxidized and the heat produced is measured indirectly, by transducers. The general properties of catalytic transducers are discussed and the pellistor, a type of transducer which is becoming widely used, is described in some detail. The properties of the several types of pellistor used in portable indicators and in continuous monitors are compared with those of other catalytic transducers; the main advantage of the pellistor is its stability in continuous operation. Some instruments based on the pellistor are described briefly. (Author abstract modified)
APTIC-22005

SELECTION OF A METHOD FOR PREPARATION OF MIXTURE FOR CHROMATOGRAPH CALIBRATION.

(Vybor metoda prigotovleniya smesi dlya
kalibrovki khromatografa). Text in Russian.
Teploenergetika, 15 (3):67-69, 1968. 3 refs.
Z. I. Geller, A. S. Kov'syuk, Yu. I. Arutyunov,
and Z. K. Tkachuk.
Identifiers: *Gas chromatography, *Calibration methods, Ussr.

Three methods for preparing standard mixtures for chromatograph calibration are compared: dosage of components by 1) gasmeter, 2) calibrated microburet, 3) syringe. The accuracy and sources of errors of individual methods are discussed. The error in dosing plays the most substantial role in total error. A simple and rather accurate method is proposed for chromatograph calibration using one standard mixture. According to the method, the original sample is diluted in steps by carrier gas. The error in concentration determination thus becomes systematic quantity (unlike the case when more than one standard mixture is used). Also the dispersion of points on the calibration curve, increasing with number of mixtures, will be minimized. The device is described, which when connected to a chromatograph, enables repeated sample dilution and analysis on the chromatograph. In this set-up, error in calibration is comparable to the error of the chromatograph.
APTIC-22011

FIBROUS DUST-ITS MEASUREMENT AND CONTROL.

Fuel, 49 (3):900-910, July 1970. 50 refs. (Presented
at the CIM 72nd Annual General Meeting,
Toronto, Canada, April 1970.)
Gyan S. Rajhans.
Identifiers: *Asbestos, *Dusts, *Samplers, Thresholds, Lung cancer, Asbestosis, Canada, Konimeters, Particle size, Impingers, Membrane filters, Scrubbers, Ventilation.

The strategy of asbestos dust sampling is summarized, and the relationships between exposure level and particle size to the diseases asbestos can cause, such as asbestosis, lung cancer, and mesotheliomas, are reviewed. A basis for determining the threshold level value (12 fibers per ml for fibers greater than 5 micron in length) of asbestos in provided. The sampling instruments which can be used for asbestos include the Konimeter, impinger, thermal precipitator, and membrane filter. General principles suggested to minimize asbestos dust including substitution, segregation, and dust suppression. Specific control methods include process enclosure, ventilation, and wet scrubbing.
APTIC-22017

APPARATUS FOR MEASURING DUST PARTICLE DEPOSITS.

(Vorrichtung zur Messung von
Staubpartikelablagerungen). Text in German.
(SAAB Aktiebolag, Linkoping (Sweden)) Swiss
Pat. 483,628. 4p., Feb. 13, 1970. (Appl. Nov. 26,
1968, 1 claim).
Gustav Ragnar Eriksson.
Identifiers: *Design criteria, *Dusts, *Measurement methods, Sweden, Collectors.

An improved apparatus for measuring dust deposits based on light dispersion from dust particles deposited on a dark collecting plate is presented. The light reflected from the dust particles is a measure of the number of particles on the plate and of average concentration of dust in the atmosphere of a given space. The collecting plate, subjected to dust deposits and then inserted into a closed holder, can be slid into or out of a measuring apparatus (consisting of light source, optics and light measuring device enclosed in a light tight housing) with the aid of a slide plate. The innovation is characterized by a plate holder provided with movable cover plate above the dust collecting plate and which in the closed position is fixed in the holder of the slide plate in such a way that the cover plate shifts with respect to slide plate automatically when the slide plate is pulled in or out. Thus the dust collecting plate is exposed to measure space and at the same time isolated from the measuring apparatus. Several diagrams with detailed description of apparatus function are enclosed.
APTIC-22019

METHOD OF CONTINUOUS ELECTROCHEMICAL MEASUREMENT OF SULFUR DIOXIDE CONCENTRATION IN GASES AND APPARATUS FOR THE MEASUREMENT.

(Verfhren zum Kontinierlichen elektrochmischen
Messen der Konzentration von Schwefeldioxyd in
Gasen und Vorrichtung zum Durchfuehren dieses
Verfahrens). Text in German. (Ceskoslovenka
Akad. Ved, Prague)) Swiss Pat. 482,189. 4p., Jan.
15, 1970. (Appl. Oct. 26, 1962, 2 claims).
Jiri V. A. Novak.
Identifiers: *Sulfur dioxide, *Potentiometric methods, Portable, Czechoslovakia, Continuous monitoring.

The new method for continuous electrochemical measurement of sulfur dioxide concentration in gases is proposed, according to which the analyzed gas is continuously and at constant flow velocity brought into contact with the flowing solution containing elementary iodine which is thus reduced to iodide. The iodide containing solution is continuously electrolyzed with the measuring electrode as anode and reference electrode as cathode. The electric current necessary for this electrochemical conversion and proportional to SO2 concentration is measured. The new method removes drawbacks of methods used so far combining advantages of polarographic and coulometric analyses. The measuring electrode is kept at a potential at which the iodide forms a polarographic limiting current. The gas remaining after the SO2 absorption is bubbled through the solution so that almost complete oxidation of iodide ions takes place in a very short time. Under this assumption, the measured electrolytic current depends on SO2 concentration and flow velocity of analysed gas only and not on temperature or on change in activity of the measuring electrode. A portable apparatus for measurement is described. As a reference electrode, Pt or carbon electrode immersed into bichromate ions containing solution is used. The latter serve as repolatizer of the electrode.
APTIC-22020

EXTREMELY FINE SIEVES FOR QUANTITATIVE SAMPLING OF AEROSOLS FOR ELECTRON-MICROSCOPIC EVALUATION.

(Feinste Siebe fuer die quantitative Probenahme
von Schwebstoffen zur
elektronenmikroskopischen Auswertung). Text in
German. Staub, Reinhaltung Luft, 30 (6):246-249,
June 1970. 5 refs.
Wilhelm Walkenborst.
Identifiers: *Aerosols, *Sieve analysis, *Membrane filters, Germany, Design criteria, Electron microscopy, Aluminum oxides, Permeability.

A new method is described of collecting samples of aerosols which is more reliable than and avoids many of the difficulties of the existing sampling methods. It involves the use of carrier, substances in the present instance made of platinum, 2.5 mm in diameter and 1 mm thick, provided with nineteen 70 micrometer diameter drilled holes, and covered with a fine-pore pellicle. This pellicle must be thin to let through electrons and the pores must be fine enough to retain the smallest particle sizes of an aerosol in the correct proportions. Both requirements are satisfied by a pellicle of aluminum oxide prepared by anodic oxidation using a definite procedure which is described in detail. Quite generally, the structure of such pellicles depends strongly on the electrolyte used in their preparation. Thus, while boric or citric acids yield a pore-free pellicle, sulfuric, chronic, or oxalic acid would dissolve and slowly yield pellicles consisting of 0.002 to 0.005 - micrometer thick pore-free base layer and a porous top layer the thickness of which varies with the duration of the treatment. Pellicles prepared by using this procedure have very small holes of very nearly the same diameter of about 0.025 micrometers. An air sampling and measuring device uses alumina-pellicle filters and is capable of aspirating and measuring sample volumes of up to 20 milliliters at a volume rate of flow of 1 milliliter of aspirated air per minute. It is described and its use illustrated by results obtained with samples of several kinds of polluted air. Stability of the Al203 pellicle at temperatures up to about 700 C can be used to advantage for separation of combustible from non-combustible constituents of an air sample by microincineration.
APTIC-22029

A PARTICLE-SIZE SPECTROMETER FOR AEROSOLS UTILIZING THE SMALL-ANGLE SCATTERING OF THE PARTICLE IN A LASER BEAM.

(Ein Teilchengroessenspektrometer fuer Aerosole
unter Ausnutzung der Kleinwinkelstreuung der
Teilchen in einem Laserstrahl). Text in German.
Staub, Reinhaltung Luft, 30 (6):238-245, June
1970. 20 refs.
Josef Gebhart, Jan Bol, Werner Heinze, and
Werner Letschert.
Identifiers: *Aerosols, *Lasers, *Spectrometry, Germany, Particle size, Calibration methods, Design criteria, Mathematical analyses, Diffraction, Light scattering.

The theoretical basis, important characteristics, and design of the optical and electronic subsystems of a spectrometer are described, which utilizes the small-angle scattering (theta smaller than 7.5 deg) of light by aerosol particles illuminated by a laser beam for determination of their size. By confining measurements to the narrow forward scattering in which the diffraction component predominates, near independence of the shape and the optical properties of the material of the particles is achieved. The spectrometer's small measuring volume of 0.01 cu mm allows measurements of aerosols with particle concentrations of up to 10,000 per cu cm. Its lower detection limit is set by the Rayleigh-scattered light from air molecules, corresponding to a particle diameter of about 0.17 micrometers. The calibration curve and the resolution of the spectrometer were determined with the aid of monodisperse test aerosol. Resolution if defined as in a conventional optical spectrometer as the ratio d/delta-d, where d is the particle diameter and delta-d is the measured effective width of the particle size distribution of a monodisperse aerosol. It ranges between 5 and 9 depending on the particle size.
APTIC-22030

ACOUSTICAL BACK COUPLING AS AN AUXILIARY MEANS IN THE DETERMINATION OF DUST CONCENTRATIONS WITH THE AID OF AN OSCILLATING TAPE.

(Akustische Ruechkkopplung als Hilfsmittel bei
der Bestimmung von Staubkonzentrationen mit
Hilfe eines schwingenden Bandes). Text in
German. Staub, Reinhaltung Luft, 30 (6):235-238,
June 1970. 7 refs.
Theodor Gast.
Identifiers: *Dusts, *Oscillating tape, *Acoustic back-coupling, Germany, Measurement methods, Design criteria, Electrical properties.

A method was developed for measuring the small increment is mass on a transversely oscillating thin homogeneous tape due to a uniform layer of dust particles having settled on it, by the concomitant change in frequency of oscillation of the tape. The underlying functional relation is of the same form as that for a uniform string subject to longitudinal tension, whose mass is augmented by a small mass distributed uniformly over the length of the string between its two supports. A sufficiently high sen-

sitivity can be obtained at a relatively low frequency of tape oscillation, at which the adhesive force of dust particle exceeds at all time the inertial force due to to their oscillatory motion, that they do no leave the tape after settling on it. Transducers of tape oscillations were experimented with, either into electric voltage or electric current oscillations of the same frequency, in which the tape was excited by a combination of loudspeaker, amplifier, and electrostatic sensor in an electro-acoustical back-coupling circuit. Results of tests with such back-coupling and with known mass increments showed that at a frequency of 290 Hz and a count time of 10 sec, a resolution of 2 micrograms can be obtained when oscillating in air. In a vacuum, a considerably higher resolution may be achieved. For continuous measurement of settling dust a long tape is used moving at constant speed and a constant longitudinal tension past two points of wedge-shaped gas bearings. At the first pair, a reference measurement of the frequency of oscillation of the clean tape is made, at the second pair, the oscillation frequency of the dusty tape is measured. The difference of the two measured frequencies is a measure of the dust concentration in air.
APTIC-22032

PROCEDURE FOR CONTINUOUS NITROGEN DIOXIDE ANALYSIS.
(Assignee Not Given.) U. S. Pat. 3,512,937. 7p., May 19, 1970. 2 refs. (Appl. June 6, 1967, 10 claims).
Ferdinand Schulze.
Identifiers: *Saltzman method, *Continuous monitoring, *Nitrogen dioxide (no2).

A reagent formulation system for continuously analyzing air, inert gases, and the like for micro amounts of nitrogen dioxide is described. This system, an improvement of the Saltzman method, utilizes 1-amino-2,5-benzenedisulfonic acid as the diazotizable compound together with N- (1-naphthyl) ethylenediamine as the coupling compound. The improvements of this system over previous ones include more rapid development of color to enhance response rate of instrumentation; the reagent formulation can be recovered continuously for reuse, avoiding the necessity of storage and preparation; the reagent will not dry out and form a solid deposit; and the overall chemistry overcomes previous deficiencies which require mechanical concessions in the equipment contributing to a lack of smooth and efficient operability. The system described responds to fluctuations in NO2 concentrations in sample air in 60-90 seconds, and is capable of unattended operation for at least a week.
APTIC-22037

COMMENTS ON: INFLUENCE OF REFRACTIVE INDEX ON THE ACCURACY OF SIZE DETERMINATION OF AEROSOL PARTICLES WITH LIGHT-SCATTERING AEROSOL COUNTERS.
Appl. Opt., 9 (8):1930-1932, Aug. 1970. 9 refs. (Includes a reply by the author, H. Quenzel.)
A. E. Martens, and D. D. Doonan.
Identifiers: *Refractive index, *Aerosols, *Particle counters, Particle size, Light scattering.

For the past three years, the angle region of the collected scattering in the Bausch and Lomb counter has been 17 to 67.5 deg rather than 20 to 40 deg as stated by Quenzel in a previous paper; thus, his conclusions based on this assumption are in error. The optical configuration of this instrument was chosen to reduce the effects of the refractive index and particle's shape in the size measurement. Literature is also cited contrary to the statement that 'no calculations have been made to date which relate the refractive index of the particles to the intensity of scattered light.' It is also pointed out that an ideal light scattering aerosol counter should indicate particle size independent not only of refractive index, but also independent of the particle's shape, surface properties, and the particle's orientation with respect to the instrument's optical system. The refractive index, shape, and surface properties of constituent particles vary tremendously, as spherical particles are rarely present in most of the aerosols. Hence, with any counter the measurements are valid only on a statistical basis and in terms of an arbitrarily chosen size parameter- the equivalent diameter. New calculations are provided by H. Quenzel, using two angle regions which were offered in the comments to him.
APTIC-22046

ANALYSIS OF AUTOMOBILE EXHAUST GASES BY GAS CHROMATOGRAPHY.
(Gasu kuromatogurafi ni yoru jidoshahaiki gasu no bunseki). Text in Japanese. Kagaku No Ryoiki (J. Japan. Chem.), 20 (6):431-444, 1966. 44 refs.
Kazuo Ohta.
Identifiers: *Engine exhausts, Japan, Gas chromatography, Alcohols, Aldehydes, Aliphatic hydrocarbons, Aromatic hydrocarbons, Ketones, Physical states.

Typical examples of using gas chromatography for analyzing automobile exhaust gases are introduced. Exhaust gases have very complicated and numerous components. For the components that are very small in concentration, condensation or sensitive detectors such as hydrogen flame ionization detectors are necessary. Since the components have a wide range of boiling points, their complete separation is quite difficult with only one type of filler substance or temperature, and multi-stage chromatographs or the separative absorption of unsaturated hydrocarbon are necessary. Where there are components that consist of condensed particles of high boiling point substances, it is more useful to treat them all together with the other components. Detailed discussions are presented on the methodology such as collection of samples, condensation and the introduction of the sample to the gas chromatograph for substances of low, high and intermediate boiling points. Discussion is devoted to the actual gas chromatography of inorganic gases, gases consisting mainly of methane, aliphatic hydrocarbons, aromatic hydrocarbons, and oxygen compounds such as alcohols, aldehydes and ketones. The examples are mainly based on bibliographic data from the U. S.
APTIC-22060

THE 'STARTING PLUME' IN NEUTRAL SURROUNDINGS.
For primary bibliographic entry see Field 05.
APTIC-22065

CONCENTRATIONS OF CHLORIDE AND DEUTERIUM IN RAINWATER AS A FUNCTION OF RAINDROP DIAMETER AND THEIR RELATIONSHIP TO RAINFALL INTENSITY.
J. Meteorol. Soc. Japan, 42 (6):354-361, Dec. 1964. 7 refs.
M. Komabayasi, and T. Gonda.
Identifiers: *Particle size, *Chlorides, *Hydrogen, *Raindrop spectrograph, Japan, Rain, Isotopes.

Rainwater was collected separately according to drop sizes by using a raindrop spectrograph. Chemical compositions were measured and compared with intensity of rainfalls at each range of drop size. In the case of large raindrops, the concentration of chloride in rainwater increases with increase in intensity of rainfall. In the case of small raindrops, the concentration of chloride in rainwater decreases with increase in intensity of rainfall. In some samples of rainwater, the concentration of deuterium was measured. In order to estimate the amount of chloride collected as dry fallout, distilled water was exposed every time in the air stream of the raindrop spectrograph. The contamination of the exposed distilled water was chemically analysed, and a correction of chloride content in rainwater was made by subtracting the amount of the chloride content of contamination from the value of the chloride content in the rainwater in collectors. (Author abstract modified)
APTIC-22067

EQUIPMENT FOR CONTINUOUSLY MONITORING METHANE ON THE FACE: THE 4-HEAD METHANE MONITOR TYPE 225.
Mining Engr. (London), 128 (100): 245-251, Jan. 1969. 3 refs. (Presented at a Colloquium on Firedamp Measurement and Control, Middlesex, England, May 3, 1968.)
L. R. Cooper.
Identifiers: *Potentiometric methods, *Continuous monitoring, *Methanes, Great britain, Mining, Design criteria, Voltage.

The continuous monitoring of methane by a 4-head monitor is described. The basic elements of the monitoring device are pellistors which have an accuracy of 0.25% methane at 1.25% methane. A pellistor consists of a coil of fine platinum wire surrounded by a bead of porous alumina. The alumina serves as a support for the platinum and palladium catalysts which assist in the combustion of methane. Another type of pellistor, called the compensator, does not have the catalysts, but is chemically poisoned so that methane will not burn at its operating temperature. The basic electrical circuit in which the pellistors are used is the Wheatstone bridge. If methane is present in the air, it burns on the detector pellistor, causing it to become hotter, which in turn increases the resistance of its wire coil and unbalances the bridge. This unbalance produces a signal at the output which is linear up to 3% methane, the working range of the 4-head monitor. The 4-head monitor Type 225 has been designed for use in roadways and on coal faces at four separate points and to measure the airflow at one point. The monitor is powered by a standby battery and provides flashing warning lights when dangerous conditions are measured. All the information can be transmitted to the pit surface. The conditions and limitations of operation are also considered.
APTIC-22069

THE SELECTIVITY OF AEROSOL ATTENUATION IN OZONOMETRIC OBSERVATIONS OVER ZAILIYSKIY ALA TAU.
Probl. Fiz. Atm., no. 5. 1967. 25 refs. Translated from Russian. Aztec School of Languages, Inc., McLean, Va., Research Translation Div., p. 224-240, June 1970. CFSTI: NASA TT F-587
A. L. Osherovich, and A. K. Suslov.
Identifiers: *Aerosols, *Photometric methods, *Ozone, Ussr, Experimental methods, Scattering (atmospheric).

A series of parallel electrophotometric observations of atmospheric ozone is described. The experiments are undertaken in an attempt to evaluate different methods of observation of aerosol extinction and in order to improve upon the techniques wherever possible. Simultaneous observations at different altitudes are necessary for a further investigation of the aerosol correction. A comparison of the data should be carried out with narrow light filters and instruments of the same type, since in the opposite case the Forbes effect greatly decreases the accuracy.
APTIC-22072

A COMPARATIVE STUDY OF THE MEASUREMENT OF ATMOSPHERIC AIR POLLUTION BY THE ASPIRATIONAL AND SEDIMENTATION METHODS.
(Badania porownawaze zapylenia powietrza atmosferycznego metoda aspiracyjna i sedymentacijna). Roczniki Panstwowego Zakladu Higi., 19 (6): 641-651, 1968. 11 refs. Translated from Polish. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 17p., Oct. 23, 1969.
Jan Just, Stefan Maziarka, and Halina Wysznska.
Identifiers: *Dusts, *Aspirators, *Sedimentation, Europe, Urban areas, Dust fall, Measurement

methods, Sampling methods, Mathematical analyses.

Systematic measurements of dust pollution were conducted simultaneously by the aspiration and sedimentation methods in 10 Polish cities during 1966 and 1967. The aspiration method is based on the day-long aspiration of air through a glass fiber filter; the concentration of dust is determined by the difference in weight of the filter before and after collection. In the sedimentation method, glass jars are exposed for a month and the dustfall is weighed after washing and drying. The distributions of the measurements indicated a rather close relationship between the two sets of measurements obtained by each of the two methods. Equations are presented by means of which measurements obtained by either method can be converted to results which the other method would have yielded. They can also be used to approximate the concentrations of atmospheric dust in a city from available dustfall data. The dust concentrations in the cities studied were highly correlated (the correlation coefficient equalled 0.78), indicating that the ratio of the amounts of relatively precipitable dusts to suspended dusts in large cities is comparatively stable. Distinct differences in the chemical composition of dusts, depending on the degree of dispersion, were found. The steadily sedimenting dusts contain significantly smaller quantities of benzene-extractable substances and lead compounds as do suspended dusts.
APTIC-22079

STANDARD METHOD FOR PARTICLE SIZE DETERMINATION.

9p., Sept. 1, 1966. 12 refs.
Personal Author Not Recorded.
Identifiers: *Particle counters, *Particle size, Particulates, Membrane filters, Microscopy.

A standard method to assess size-weight fractions of particulate matter is presented. The method permits isokinetic capture of the particulate matter without altering the physical properties. Collection is done with a membrane filter device. Particle sizing by light field microscopy is used to establish a particle size distribution. Particles are counted according to a statistically unbiased procedure commonly called multistage sampling. A cumulative distribution is used to show the differences in the characteristic size-weight of the sample. An example of the method is provided.
APTIC-22089

ORGANIZATION OF EXPERIMENTAL STUDIES OF THE EMISSION OF POLLUTANTS FROM STRONG SOURCES.

(Postanovka eksperimental'nykh rabot po izuchenoyu rasprostraneniya vrednykh primesey ot moshchnykh istochnikov). Text in Russian. Tr. Gl. Geofiz. Observ. (Leningrad), no. 234:109-115, 1968. 14 refs.
B. B. Goroshko.
Identifiers: *Experimental methods, *Survey methods, Ussr, Analytical methods, Mathematical analyses, Plume behavior, Meteorology.

Various experimental procedures used in work carried out by the Main Geophysical Observatory in Leningrad in cooperation with a number of other organizations are reviewed for the purpose of promoting standardization of these procedures. These include ground meteorological observations, determination of plume parameters, air sampling beneath the plume, and determination of emission characteristics. Computational procedures for determining emission characteristics are also reviewed.
APTIC-22090

PROCEDURES AND RESULTS OF HELICOPTER STUDIES OF AIR POLLUTION.

(Voprosy metodiki i rezul 'taty issledovaniya zagryazneniya atmosphery s pomoshch 'yu vertoleta). Text in Russian. Tr. Gl. Geofiz. Observ. (Leiningrad), no. 234:85-94, 1968. 4 refs.
B. B. Goroshko, A. S. Zaytsev, and V. Ya. Nazarenko.
Identifiers: *Propeller aircraft, *Air quality measurements, *Survey methods, Ussr, Industrial areas, Combustion gases, Dusts, Primary metallurgical processing, Aspirators, Design criteria, Lower atmosphere, Temperature (atmospheric), Carbon monoxide, Nitrogen oxides, Sulfur dioxide.

A helicopter mounted aspiration air sampler for use in air pollution studies at heights from 100-1400 m is described. Data on sulfur dioxide, nitrogen oxide, and dust content were obtained during flights over Krivoy Rog in 1967. Vertical temperature and impurity concentration profiles in the vicinity of a metallurgy combine are plotted. Pollution levels in mg/cu m ranged as follows: sulfur dioxide, 0.63-0.91; nitrogen oxides, 0-0.39; dust, 0.1-0.5; and carbon monoxide, 4.9-9.6.
APTIC-22091

SMOKE FILTER CALIBRATION CURVE: 1-CM FILTER HOLDER.

Warren Spring Lab., Stevenage, U. K., Atmospheric Pollution Div., Rept. LR 89 (AP), SBN 900790172, 11p., Oct. 1968.
D. L. R. Bailey, and H. L. Nicholson.
Identifiers: *Smokes, *Membrane filters, *Calibration methods, Great britain.

A calibration curve for standard smoke is derived for a 2.54 cm filter holder. The new standard is necessary because of low concentration sampling which would not correlate with the darkness index for higher concentrations. If the diameter of the stain is reduced while the air flow is held substantially constant, the velocity of impact of the smoke particles on the filter paper is increased, causing deeper penetration; hence an increased concentration per unit area is required to obtain a particular darkness index. This effect is examined for a stain of 1 cm diameter. Over a range of smoke concentrations from 5 to 20 micrograms/cu m, the 2.54 cm calibration can be used with a multiplying factor of 1.30. (Author abstract modified)
APTIC-22094

DETECTION OF OIL AEROSOL IN AIR.

(K opredeleniyu maslyanogo aerozolya v vozdukhe). Text in Russian. Nauch. Rab. Inst. Okhr. Tr. Vses. Tsent. Sov. Prof. Soyuzov, no. 44:92-95, 1966. 6 refs.
B. Ye. Andronov.
Identifiers: *Aerosols, *Membrane filters, Ussr, Dusts, Flow rates.

Detection of oil aerosol using an AFA-KhA filter at a filtering rate of 10 l/min gave satisfactory results when 50 liter probes were made at aerosol concentrations of 5-10 mg/cu m. Concomitant determination of dust content requires sampling of 250-500 liters of air. Sampling procedures are detailed and a standard scale for oil aerosol detection is presented.
APTIC-22097

A COMPARISON OF PARTICLE SIZE MEASUREMENTS.

Am. Ind. Hyg. Assoc. J., vol. 22:307-312, Aug. 1961. 4 refs. (Presented at the American Industrial Hygiene Association, Annual Meeting, 22nd, Detroit, Mich., April 1961.)
E. J. Baier.
Identifiers: *Personnel, *Particle size, *Data analysis, Dusts.

The determination of particle size is essential to the evaluation of airborne dust hazards. A set of 18 slides was prepared and circulated among 30 persons of varying experience in particle size determination. They made 206 particle size determinations. Statistical evaluation of the results are presented. Industrial hygienists with very little or very much experience in the total field of industrial hygiene demonstrated the greatest variance of measurement. Those in the experienced group are primarily in the supervisory category, and their errors appear to be due to a lack of constant use of the microscope. Practice, rather than experience, seems to be the main criterion of accuracy in particle size measurement. (Author abstract;
APTIC-22106

AUTOMATIC BOF STACK MONITORING.

Mag. Metals Producing, 6 (5): 97-104, May 1968.
W. P. McShane, and E. Bubba.
Identifiers: *Stack sampling, Stack gases, Basic oxygen furnaces, Stacks, Automatic methods, Electrostatic precipitators, Computers, Design criteria.

An automatic stack monitoring system is described. The system consists of a tape sampler, a device to prevent vapor condensation, and a beta-radiation measurement arrangement which depends only on the weight of the collected material and not on chemical or physical properties. The measured value is sent to a computer, which records the data and determines whether the control equipment is working properly. A field test of the monitoring system on an electrostatic precipitator on the stack of a basic oxygen furnace is described. The installation of the monitor, the sampling sequence and procedure, and a statistical analysis of the results are discussed.
APTIC-22107

DETERMINATION OF SULFUR OXIDES IN STACK GASES.

Anal. Chem., 30 (10):1680-1682, Oct. 1958. 9 refs.
Edwin B. Seidman.
Identifiers: *Stack gases, *Colorimetry, *Sulfur oxides, Petroleum refining.

One existing method of determining the sulfur dioxide and sulfur trioxide content of combustion gases requires absorption of the gas sample in a known amount of industrial base. After absorption, excess base is titrated and total sulfur oxides are obtained by the difference. The sulfur trioxide is then precipitated as benzidine sulfate, redissolved, and titrated. Sulfur dioxide is determined by the difference. Ammonia and nitrogen oxides present in catalytic cracking gases interfere with the sensitivity of the method. Even when no interfering substances are present, the method is difficult to apply to refinery stack gases since the colorimetric titration end point is frequently obscured by dark-colored oxidation products from inhibitors present in the absorber solution. Also the solubility of benzidine sulfate in water severely curtails washing of the precipitate. In an improved method, sulfur trioxide in stack gases as low as 0.001% gas volume can be determined in as much as 0.3% gas volume sulfur dioxide. Ammonia and/or nitrogen oxides do not interfere. Sulfur dioxide is absorbed quantitatively in an 80% isopropyl alcohol solution, which inhibits oxidation of sulfur dioxide. The sulfate is titrated with 0.01 N barium chloride in a solution of 80% isopropyl alchohol, with Thorin used as the indicator. The end point is sharp and reproducible, and the titration is rapid. A modification of this procedure is suitable for the determination of total sulfur oxide.
APTIC-22108

PROCEDURE FOR THE DETERMINATION OF PARTICULATE CONTAMINATION OF AIR IN DUST CONTROLLED SPACES BY THE PARTICLE COUNT METHOD.

ARP 734, 7p., Aug. 30, 1962.
Personal Author Not Recorded.
Identifiers: *Particle counters, *Particulate sampling, *Controlled atmospheres, Suspended particulates, Particle size, Impingers, Membrane filters, Microscopy.

A self-checking procedure is incorporated in a particle-count method for determining suspended particulates five micron or larger. Air from the controlled area is filtered through a membrane disc

filter, with vacuum used to impinge the entrained contaminants on the surface of the filter. The filter disc is examined microscopically (with oblique incident lighting) to determine the amount of contaminant present in a stated size range. A stage micrometer is employed to calibrate the ocular micrometer used for particle magnification. To obtain the number of particles of a given size range, the number of particles on a representative number of grid squares of the filter disc is calculated. From this count, the total number of particles is calculated. Calibration of the ocular micrometer and individual interpretation of size range limits defined by the ocular micrometer rulings should be checked by means of calibrated standards. Sample filter discs, permanently mounted and containing representative contaminant, make it possible to check the optical portion of the analytical procedure. The actual count of these filter discs should be known within the limits of statistical accuracy. A maximum variation of two to one (plus 33% of the average of two runs) in results should be expected for replicate counts on the same sample, provided the precautions presented regarding check samples and self-checking are followed.
APTIC-22113

DUMBBELL-DIFFUSION SCREENING FOR CARBON MONOXIDE, VOLATILE ALCOHOLS, AND CHLORINATED HYDROCARBONS IN BLOOD.

Clin. Chem., 13 (4):276-280, 1967. 9 refs.
Sidney Nobel, and Alyne Ricker.
Identifiers: *Blood gas analysis, Blood chemistry, Colorimetry, Alcohols, Chlorinated hydrocarbons, Carbon monoxide.

Rapid screening tests for the detection of carbon monoxide, ethanol and other volatile alcohols, and chlorinated hydrocarbons in blood are presented. The dumbbell-diffusion cell used was versatile in allowing reactions to occur at room temperature or at 100 C and in acting as a support for pretreated paper discs. To determine CO, a paper disc, moistened with palladium chloride, was centered on top of a ball flask. Then, 0.2 ml blood and 0.8 ml of 10% sulfuric acid were placed in the socket flask. The cell was mixed by swirling and kept at room temperature. After 10 minutes, the paper disc was removed and compared with standard black stains. To determine volatile alcohols, a potassium dichromate reagent was used; the bland was orange and the 80 mg/100 ml standard, green. Sodium hydroxide and acetone were used to determine the chlorinated hydrocarbons. The chloroform standard gave a rose color within one minute; similar concentrations of chloral hydrate and carbon tetrachloride required five minutes before the color appeared. This test detects compounds containing three halogen atoms on one carbon. Further analysis is required if the specific identity of the compound involved is required. The dichromate-reduction test for volatile alcohols is only a presumptive test for ethyl alcohol whose forensically critical range is 100-200 mg/100 ml blood. The limitations of these qualitative tests are also discussed.
APTIC-22122

ANALYSIS OF MINERAL MATTER IN COALS BY X-RAY FLUORESCENCE.

Bureau of Mines, Washington, D. C., Rept. of Investigation 7124, 20p., May 1968. 13 refs.
Martin Berman, and Sabri Ergun.
Identifiers: *Coal characteristics, *Chemical composition, *Fluorescence, Carbon black, Ashes, Particle size, Hydrogen, Aluminum compounds, Calcium compounds, Iron compounds, Magnesium compounds, Nitrogen, Oxygen, Silicon compounds, Sulfur compounds, X-rays.

An investigation of the mineral matter content of 38 American coals using X-ray fluorescence is reported. Measurements of the K sub alpha intensity for magnesium, aluminum, silicon, sulfur, calcium, and iron permit the determination of those elements as well as an indirect determination of the ash content of the coals. The percentage of each of the six elements was corrected for absorption by all six elements as well as by hydrogen, carbon, nitrogen, and oxygen. It made little difference whether the values used for hydrogen, carbon, and nitrogen were obtained from chemical analysis or whether average values for all coals were used. In all cases, oxygen was obtained by difference. The correction for absorption by all these elements involved the inversion of a 6 times 6 matrix and was performed by computer. Assuming that the elements magnesium, aluminum, silicon, calcium, and iron were present in the ash as oxides, the quantity of ash was determined. The results for the mineral elements as well as for ash and oxygen were in good agreement with chemical results. Particle size had a significant effect on fluorescence intensities. A study of size effects was made for pyrite particles, since the sulfur content of coals is of particular interest. Theoretical equations were derived and verified relating the intensity to particle size. The coal samples had to be ground to less than 2 micron. Sulfur appears in several forms in coal, and the effect of sulfur form on intensity was investigated. The K sub alpha intensity was independent of sulfur form but the K sub beta intensity varied with the type of sulfur. Thus, the K sub alpha intensity was used for determining the quantity of sulfur present. Utilization of the sulfur K sub beta intensity did not permit a determination of the proportions of sulfur forms present in coal. However, for synthetic mixtures of cystine and pyrite in carbon black, measurement of sulfur K sub alpha and K sub beta permit determination of each constituent from measurement of sulfur intensities alone. (Author abstract modified)
APTIC-22126

4. AIR QUALITY MEASUREMENTS

DEPOSITION OF RADIOACTIVE DUST AND ITS ELIMINATION FROM THE ATMOSPHERE BY PRECIPITATION.

For primary bibliographic entry see Field 05.
APTIC-15592

SENSORY EVALUATION OF DIESEL EXHAUST ODORS.

For primary bibliographic entry see Field 03.
APTIC-18231

CHARACTERISTICS OF PARTICULATE PATTERNS 1957-1966.

Public Health Service, Raleigh, N. C., National Air Pollution Control Administration, 101p., March 1970. 9 refs. CFSTI: PB 192 223. NAPCA: AP-61
Robert Spirtas, and Howard J. Levin.
Identifiers: *Non-urban areas, *Urban areas, *Suspended particulates, *Air quality measurements, *Data analysis, *Mathematical analyses, *National air sampling network (nasn), United states, Commercial areas, Combustion products, Ashes, Cinders, Particulates, Dusts, Fumes, Pollens, Smog, Smokes, Build-up rates, Dissipation rates, Measurement methods, Monitoring, Sampling methods, Particulate sampling, Computers, Data handling systems, Computer programs, Experimental methods, Field tests, Statistical analyses, Administration, Plans and programs, Air quality measurement programs, Seasonal.

The National Air Surveillance Networks have collected samples of suspended particulate matter in urban and non-urban areas across the nation since 1957. Ten years of the resulting data are graphically summarized by the application of Whittaker-Henderson Type A curve-smoothing formulas. As applied to 60 urban and 20 non-urban sites, this mathematical treatment is a new approach to the detection of cyclical patterns and long-term trends in air pollution. This study has established a typical seasonal pattern for urban sites, characterized by high winter levels and low summer levels. In contrast, relatively small geometric means, low winter levels, and higher summer levels typify non-urban seasonal patterns. At both urban and non-urban sites, spring and fall appear to be transition periods. Significant decreases in particulate levels were detected for many center-city urban sampling sites. The curves generally reveal a slight increase in particulate concentrations at non-urban sites from 1958 to 1966. (Author abstract modified)
APTIC-18232

THE CONTENT OF 3,4-BENZOPYRENE IN THE DUST OF COAL BEING TRANSLOADED IN THE PORT.

(Zawartosc 3,4-benzopirenu w pyle weglowym przy przeladunkach w porcie). Text in Polish.
Roczniki Pomorskiej Akad. Med. Szczecinie, vol. 18 Suppl. 2:167-175, 1967. 19 refs.
Stanislaw Skucinski, and Lech Kolanecki.
Identifiers: *Dusts, *Coal, *Air quality measurements, *Benzo (3-4)pyrene, Carcinogens, Europe, Coal tars, Paper chromatography, Thin-layer chromatography, Hi-vol samplers.

The content of 3,4-benzopyrene in the coal dust in the atmosphere collected in the course of coal transloading in the port of Szczecin was determined. The dust sample was collected on filter TFA no. 2133 using a Staplex Hi-Volume Air Sampler and thin layer and paper chromatographic quantitative determinations were made. The coal dust contained 2.73% by weight of tar substances. Benzopyrene content was 0.23 micrograms per gram, corresponding to 0.00085% in tar substances. Health hazards of benzopyrene are discussed. It is concluded that the hazards by carcinogens during the coal transloading in port is considerable. A short survey of carcinogens with their classification according to their activity and chemical composition is given.
APTIC-19722

PRESENT AND FUTURE COMMUTER EXPOSURES TO CARBON MONOXIDE.

Preprint, National Center for Air Pollution Control, Washington, D. C., Air Quality and Emissions Data Branch, 25p., 1964 (?).
Tabor, Lynn, Ott, and Smith.
Identifiers: *Carbon monoxide, *Urban areas, *Air quality measurements, Continuous air monitoring program (camp), Highways, Streets, Engine exhausts, Vehicles, Continuous monitoring, Mathematical modeling, Transport.

Data on the present exposures of several population sub-groups to carbon monoxide and the results of exposure projections are discussed. The greatest amount of CO data comes from the several continuous monitoring stations operating in large urban areas. A wide range of CO levels, within each city and from city to city, was found. This is believed to be due to the locations of the monitoring stations, with respect to the distance and nature of the nearest street. The greatest sampling effort was devoted to measuring commuter exposures in traffic during 'rush hour' periods. A summary of commuter exposure data is presented in tabular form. An integrated CO dosage measurement is recommended which would characterize the exposure of various population subgroups in terms of their total CO exposure over long periods of time. To predict future CO levels through 1985, a linear relationship between CO levels and an already projected variable, usually vehicle registrations or gasoline sales, is assumed. The CO levels are then calculated and scaled upward in proportion to the projected growth of the other variable. The difficulties in accurately projecting future CO levels are also discussed in detail.
APTIC-19748

OZONE CONCENTRATION IN AIR AT THE GROUND LEVEL: YEAR 1967. STATIONS OF

VAL-JOYEUX (YVELINES) AND PORT AUX FRANCAIS (KERGUELEN ISLANDS).

(Concentration de l'air en ozone au niveau du sol. Annee 1967. Stations de Val-Joyeux (Yvelines) et de Port Aux Francais (Iles Kerguelen). Text in French. Faculte des Sciences de Paris (France), Lab. de Physique de L'Atomosphere, Publ. 1969-1, 15p., 1969. 2 refs. CFSTI: N69-40508
A. Vassy.
Identifiers: *Air quality measurements, *Ground level, *Ozone, France.

The daily means of the ozone content of air at the ground level at stations in Val-Joyeux (Yvelines) and in Port aux Francais (Kerquelen Islands) until the end of 1966 were previously published in Publications Nos. 1967-1 and 1968-5 of the Laboratoire de Physique de l'Atomosphere. The present measurements refer to the year 1967 and are expressed in terms of partial pressures (in nanobars). The geographical coordinates of the above stations are Val-Joyeux: 48 deg 49 min north, 2 deg 01 min east; and Port aux Francais: 49 deg 21 min south, 70 deg 17 min east. The monthly means of the ozone partial pressure given in the tables are plotted in graphs for either station. Attention is drawn to the height of the hibernal maximum of the graph relating to the Kerquelen Islands which has been prominent on various previous graphs relating to the antarctic continent.
APTIC-19759

SURVEY OF AIR QUALITY IN THE VICINITY OF BRAYTON POWER STATION AND FALL RIVER, MASSACHUSETTS. (SUMMARY PROGRESS REPORT).

GCA Corp., Bedford, Mass., GCA Technology Div., New England Electric System Contract 904550, GCA-TR-70-8-G, 24p., March 1970.
R. Dennis, F. B. House, and R. Bradway.
Identifiers: *Sulfur dioxide, *Massachusetts, *Suspended particulates, *Air quality measurements, Area surveys, Diurnal, Hourly, Monthly, Seasonal, Stack gases, Electric power production, Dust fall, Automatic methods, Lead peroxide candle, Continuous monitoring, Gas sampling, Particulate sampling, Hi-vol samplers, Meteorology, Winds, Precipitation, Temperature (atmospheric), Temperature gradient.

The air quality survey in the Fall River, Mass. area, in progress since Nov. 1967, is described. A field measurements program was designed to determine the existing levels of sulfur dioxide and suspended particulate concentrations in the Brayton Point and Fall River areas, and to estimate the contribution of the Brayton Point Power Station effluent to SO2 and particulate concentrations. Four automatic SO2 analyzers and lead peroxide candles were used to determine SO2 concentrations; daily suspended particulate concentrations were determined with high volume samplers. Sampling data from automatic SO2 stations, hourly meteorological observation, and power plant operating parameters are digitized and punched onto cards for computer storage and processing. Average monthly sulfation rates, determined at three urban automatic SO2 sites, are 10% higher than the average of all 10 stations. Monthly dust fall measurements show no correlation with SO2 concentrations; they reflect the relative wetness or dryness of the air, the windiness, and traffic conditions. Sulfur dioxide concentrations increase during the winter months and decrease during the summer. Data on the suspended particulate concentrations are shown in tabular form. Elimination of the Brayton Point Plant as a local source would lead to only minor reductions on the overall SO2 concentrations in the Fall River area.
APTIC-19956

CONCENTRATION OF GASEOUS AIR POLLUTANTS IN POLLUTED AND 'CLEAN' ZONES.

Staub (English translation from German of: Staub, Reinhaltung Luft), 29 (12):21-26, Dec. 1969. 4 refs.
Albert Koehler, and Walter Fleck.
Identifiers: *Non-urban areas, *Industrial areas, *Air quality measurements, Annual, Diurnal, Seasonal, Germany, Spores, Dusts, Suspended particulates, Pollens, Colorimetry, Saltzman method, Measurement methods, Gas sampling, Hi-vol samplers, Impingers, Fluorine, Carbon dioxide, Nitrogen dioxide (no2), Sulfur dioxide, Radioactive radiation.

The concentration of gaseous air pollutants in polluted and clean zones was measured in 1967 and 1968. Carbon dioxide was measured by an infrared analyzer, total sulfur concentration by the water wash-bottle method, nitrogen dioxide by the Saltzman method, and fluorine by the standard impinger and colorimetric methods. In addition, the concentrations of suspended matter, dust precipitation, radioactivity, and biological objects were also determined. An analysis of the annual and daily variations shows distinct differences between the polluted and clean zones. The concentrations of sulfur compounds and nitrogen dioxide are 10 to 15 times higher in the polluted zones than in the clean zones. The CO2 concentration, which is largely controlled by natural phenomena, is up to 20 ppm higher in polluted zones than in clean zones. (Author summary modified)
APTIC-19966

MEASUREMENT OF ATMOSPHERIC CONCENTRATION OF SULFUR OXIDES AND NITROGEN OXIDES BY FILTER PAPER IMPREGNATED WITH ALKALI IN KONOHANA, OSAKA CITY.

(Osaka-shi Konohana-ku ni okeru arukari roshiho ni yoru iwosankabutsu oyobi chissosankabutsu nodo bumpu ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4 (1):8, 1969. (Proceedings of the 10th Annual Meeting of the Japan Society of Air Pollution, 1969.)
A. Konoe, T. Kanmori, K. Seki, and Y. Takahashi.
Identifiers: *Air quality measurements, *Nitrogen dioxide (no2), *Sulfur trioxide, *Konohana, *Osaka, Japan, Urban areas, Industrial areas, Residential areas, Continuous monitoring, Filters.

The Konohana district of Osaka, an area elongated in the east-west direction, was divided into grids in the range of 400 to 800 meters; sulfur trioxide as well as nitrogen dioxide in air were measured by alkali filter paper, for the period between the fifth of each month. The results were tabulated in milligrams per day 100 sq cm by location (grid number) and maximum, minimum, and average values. The sulfur trioxide concentration in the western industrial section was high and low in the eastern residential section, and high along the waterfront and low in the interior, with localized high concentrations. Thus, most of the pollution sources are considered to exist within the Konohana area with respect to the sulfur trioxide pollution.
APTIC-20649

TRACE METALS IN SUSPENDED PARTICULATES IN OSAKA PREFECTURE. PART I.

(Osaka ni okeru fuyufunjinchu no kinzokuseibun (1). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4 (1):143, 1969. (Proceedings of the 10th Annual Meeting of the Japan Society of Air Pollution, 1969.)
T. Hasegawa, and A. Sugimae.
Identifiers: *Chemical composition, *Dust fall, *Osaka, Japan, Urban areas, Engine exhausts, Suspended particulates, Fuel oils, Cupolas, Air quality measurements, Rain, Washout, Iron compounds, Lead compounds, Manganese compounds, Vanadium compounds, Sulfur oxides, Diurnal.

Suspended dust particles in air from several locations in the Osaka area were studied over a six-month period with particular emphasis on metal elements in the particles. The dusts were collected for 24 hrs by high-volume air samplers, and were accumulated on glass fiber filters. Without prior treatment, the particles were quantitatively analyzed for metallic elements by means of spectroscopy, which was a much more direct and easier method to use than the time-consuming NASN method. In heavy oil combustion, vanadium was found in a much larger quantity than other metals, and iron and manganese proliferated around the cupola furnaces. Lead was extracted from auto exhausts. The correlation between sulfur compounds and vanadium in heavy oil combustion gas was good but on rainy days, the linear relationship went askew, apparently because rain decreases the concentration of sulfur oxides in air. Relationships between various metals were investigated in connection with location, daily variations, and meteorological factors.
APTIC-21015

ESTIMATION AND EFFECT OF CARCINOGENIC MATERIAL IN AIRBORNE PARTICULATE MATTER COLLECTED IN SOME CITIES OF POLAND. PART I. CONTENT OF BENZO (A)PYRENE AND OTHER AROMATIC POLYCYCLIC HYDROCARBONS IN THE PARTICULATE MATTER OF AMBIENT AIR IN TEN POLISH TOWNS.

(Badania skladu i wlasciwosci rakotworczych substancji zawartych w pyle zawieszonym w powietrzu atmosferycznym. Czesc I. Zawartosc benzo (a)pirenu oraz innych weglowodorow weilopierscieniowych w pyle powietrza atmosferycznego 10 miast w polsce). Text in Polish. Roczniki Panstwowego Zakladu Higi., 18 (6):638-654, 1967. 20 refs.
Jan Just, Stefan Maziarka, and Halina Wyszynska.
Identifiers: *Poland, *Dusts, *Air quality measurements, *Polynuclear compounds, Seasonal, Europe, Urban areas, Coal, Industrial emission sources, Domestic heating, Automobiles, Aromatic fractions, Aromatic hydrocarbons, Perylenes, Pyrenes, Benzopyrenes, Radioactive radiation.

A study was conducted of the air pollution in ten large towns, situated in different climatic regions of Poland. Combustion of coal in industrial and domestic hearths, and in some extent also car transport and technical processing were the main source of the atmospheric air pollution, in the examined towns. Radioactivity, the degree of the air dust pollution, and content of aromatic polycyclic hydrocarbons: pyrene, benzo (a)pyrene, benzo (e)pyrene and benzo (ghi)perylene, considered to have cancerogenic action, were determined. The samples of air were collected in centers of the towns, at the level 8--10 m, three times a week. The apparatuses, High Volume Air Sampler, type L, General Metals Works -- US, were placed in standard casings suitable for 24 hours' collecting of air in the open, and filters of sintered glass were used. The filters were weighed, and concentrations of dust in the assayed air estimated. Extraction of filters with benzene followed. The extracts separated by column chromatography into appropriate fractions, the particular polycyclic hydrocarbons, were spectrophotometrically estimated. The 24 hours' mean concentrations of dust reached rather high levels, in most cases, and particularly in Zabrze, Katowice, Krakow and Opole, exceeding often the maximum admissible level of 200 microgram/cu m. Statistically significant differences between the levels of air pollution, found in the particular towns, have been observed. (Annual mean air pollution with dust amounted to 120 microgram/cu m in Warsaw, and that in Zabrze to 300 microgram/cu m). The content of tar substances in the dust varied in the range from a few to over 20 percent; this did not correlate with the levels of dust. In certain towns, the content of aromatic polyclic hydrocarbons in the air varied during 1966 in the ranges as follows: benzo (a)pyrene from 29 to 133 microgram per 1000 cu m, pyrene from 34 to 167 microgram, benzo (e)pyrene from 14 to 80 microgram, and benzo (ghi)perylene from 34 to 125 microgram per 1000 cu m. The highest levels of these substances were found in Zabrze. The lowest concentrations of dust were found in summer months (July and August), and the highest ones in the winter season.
APTIC-22083

PROCEDURES AND RESULTS OF HELICOPTER STUDIES OF AIR POLLUTION.

For primary bibliographic entry see Field 03.
APTIC-22091

ATMOSPHERIC POLLUTION, SMOKE AND SULFUR DIOXIDE.

(Pollution atmospherique, fumee et SO2). Text in French. Bull. Mens. Inst. Royal Meteorol. Belgique, 1968, 19p., Aug. 1968. CFSTI: N69-33929
J. Bouquiaux, and J. Grandjean.
Identifiers: *Air quality measurements, *Sulfur dioxide, Belgium, Non-urban areas, Urban areas, Suspended particulates, Fumes, Photometric methods, Area surveys.

The Belgian surveillance network of atmospheric pollution comprises 230 sampling stations distributed as follows: 100 in the 5 large cities of Brussels (25), Antwerp (25), Liege (20), Charleroi (15), Ghent (15); 100 in the less important towns and at selected locations in the country; and 30 at meteorological stations equipped with anemometers. The indices of pollution chosen are the strong acidity of air expressed in micrograms of SO2 per cu m of air, and smoke or fine dust, expressed in micrograms per cu m of air. The sampling apparatus consists of an electric membrane pump sucking about 2 cu m of air per day across one of eight test circuits each consisting of a filter of Whatman paper No. 1, a bubbling jar containing 50 mg of oxygenated water (0.3% of H2O2) of pH 4.5, and a gas meter. The test circuit is automatically changed every morning at 9 o'clock (local time). Samples are removed weekly. Reflectometric analysis of the filter and acidimetric titration of the bubbling-jar liquid provide information regarding the mean concentration of smoke and of SO2 in air in the 24 hours during which the samples were taken. These values are given in tables for the Provinces of: Brabant, Liege, Luxembourg, Namur, Hainaut, West Flanders, and Antwerpen and plotted in graphs for Liege, Charleroi and Antwerpen.
APTIC-22116

AIR POLLUTION BY METALLURGICAL INDUSTRIES.

Public Health Dept., Sydney (Australia), Air Pollution Control Branch. 203p., 1962. 83 refs.
Alan Bell, and John L. Sullivan.
Identifiers: *Respiratory diseases, *Primary metallurgical processing, *Air quality measurements, *Sulfur dioxide, Pulmonary function, Asthma, Bronchitis, Common cold, Copper, Iron, Australia, Dusts, Automatic methods, Continuous monitoring, Winds, Hourly, Seasonal.

Tests for sulfur dioxide were made in Port Kembla, Australia, where iron and copper ores are smelted, and 947 residents were sent a questionnaire to determine the prevalence of chronic bronchitis, with smaller numbers undergoing a pulmonary function and sputum test. An eastern section of town, in the vicinity of the copper smelter, was the major source of SO2. Gas readings were not spectacular by daily volumetric sampling and an automatic recorder, but a continuous recorder showed that high concentrations of SO2 occurred in episodes of a few hours each. The highest result was 0.62 ppm by the former method, while peaks of concentrations greater than 5 ppm were recorded by the latter approach. Prevailing winds produced higher concentrations during the summer months when they blow frequently from a north-east direction, while pollution is blown seawards during the winter months when westerly winds prevail. When measured as water insoluble solids by a deposit gauge consisting of a six inch diameter conical glass funnel and bottle, summer dust-fall rates exceeded 100 tons per square mile/month within a half mile from the steel industries, but smoke densities were low by comparison with other cities in New South Wales despite frequent evidence of haze. A larger percentage of people living in the area of high pollution considered that they were suffering from either chronic bronchitis or bronchial asthma than in the case of the low pollution area, and only a few people complained of symptoms unrelated to the respiratory tract. Differences between the findings for the two areas were statistically significant, 7 times for women and 3 times for men, when questioned to the prevalence of nasal catarrh, whether head colds settled on the chest, number of times they were confined to bed because of chest illnesses, wheeze, cough, phlegm, and dyspnea. A higher percentage of men wheezed and were affected by cough and phlegm than was the case for a small group of Englishmen who never worked in the dusty occupations, although this was not the situation when compared with English foundry employees. Out of the 333 sputa collected in East Port Kembla, 84.7% were mucoid and 15.3% of a mucopurulent nature, while pulmonary function tests showed no statistically significant differences between the two areas, except for females aged 70-84. Dental evidence suggested that some external influence might be exerting a harmful effect on the gingival tissues of young people living in the area of high pollution.
APTIC-22118

5. ATMOSPHERIC INTERACTIONS

DEPOSITION OF RADIOACTIVE DUST AND ITS ELIMINATION FROM THE ATMOSPHERE BY PRECIPITATION.

(Osedaniye radioacktivnoy pyli i eye udaleniye iz atmosfery osadkami). Text in Russian. Atom. Energ. Moscow), 1-42p., 1968. 206 refs.
K. P. Makhon.
Identifiers: *Precipitation, *Washout, *Fallout, Ussr, Mathematical analyses, Lower atmosphere, Topographic interactions.

Precipitation of dust in dry weather, and the washout of dust with precipitation are reviewed. The following topics are included: theoretical calculation of 'wet' precipitation, capture mechanism; experimental data on radioactivation of droplets; empirical expressions for washout of natural and artificial radioactivity; washout parameters for natural radioactivity and the effect of rain on the concentration of atmospheric radioactivity. The general patterns of natural removal of radioactivity from the lower atmosphere are concluded to be more or less broadly understood. A number of integral expressions for self-purification of the atmosphere have been established and evaluation has been made of the integral parameters of 'dry' and 'moist' fallout. Subjects cited for further study include: reliable methods for measuring 'dry' global fallout, the role of vertical air flows in radioactive fallout, and various washout processes.
APTIC-15592

RESEARCH AND DEVELOPMENT TECHNIQUE FOR ESTIMATING AIRFLOW AND DIFFUSION PARAMETERS IN CONNECTION WITH THE ATMOSPHERIC WATER RESOURCES PROGRAM. (FINAL REPORT).

Colorado State Univ., Fort Collins, Fluid Dynamics and Diffusion Lab., Bureau of Reclamation Contract 14-06-D-6455, CER69-79JEC-LOG-MMO-11, 77p., Aug. 1969, 20 refs.
CFSTI: PB 185890
J. E. Cermak, L. O. Grant, and M. M. Orgill.
Identifiers: *Diffusion, *Atmospheric movements, Colorado, Mountains, Valleys, Experimental methods, Mathematical modeling, Simulation, Diffusion models, Plume behavior, Tracers, Transport, Condensation (atmospheric), Clouds, Snow, Cloud seeding, Stability (atmospheric), Topographic interactions, Turbulence (atmospheric), Silver iodide, Radioactive tracers.

A stably stratified atmospheric boundary layer was simulated in a wind tunnel and utilized to determine radioactive krypton dispersion patterns over a 1:9600 scale model of the Eagle River Valley and topography surrounding Climax, Colo. Geometric, dynamic, and thermal similarity are considered, primarily, for barostromatic airflow. Similarity criteria for transport and dispersion are also considered. Field data indicates that airflow and temperature characteristics over the model are approximately similar to a prototype storm. Dispersion measurements were taken by using sources representative of field ground sources. Model and field measurements confirm that seeding nuclei are reaching the target area from the present existing ground sources. Limited field measurements of ice nuclei concentrations at Chalk Mountain show a variation of 5 to 300 parts per liter. Concentration values deduced from radioactive gas measurements over the model show values within the same range but closer to the optimum values indicated by present cloud physics mode. The barostromatic airflow model indicated that topography plays an important role in determining the downwind direction of the particulate plume. (Author abstract modified)
APTIC-15594

LIGHT SCATTERING IN A SPHERICAL ATMOSPHERE CONTAINING AEROSOLS.

For primary bibliographic entry see Field 06.
APTIC-18204

NUCLEATION FACTORS IN THE DEVELOPMENT OF CLOUDS.

Pennsylvania State Univ., University Park, Dept. of Meteorology, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., Dec. 1967, 133p. 62 refs.
James Edward Jiusto.
Identifiers: *Clouds, *Nucleation, Industrial emission sources, Particle size, Fog, Precipitation, Weather modification, Particle growth.

A study of atmospheric condensation with attention given to distinctions between hygroscopic and nonhygroscopic condensation nuclei is reported. Oceanic and oragraphic cloud nucleus concentrations measured in Hawaii, and results of thermal gradient diffusion chamber studies are reported. Nonhygroscopic particles are more effective as condensation nuclei than is predicted by the Volmer theory of nucleation. Expressions are developed for salt nuclei size as a function of fall distance and dwell time in a cloud. These results indicate optimum particle sizes of 5-10 millimicron with regard to potential fog modification. Only slight reduction in ambient relative humidity (1% or less) can cause a considerable shift in fog droplet size distribution and attendant increased visibility. Ice crystal growth in supercooled lake-storm clouds was studied for the Great Lakes region and the feasibility of modifying snowfall patterns by seeding is examined. A specially-developed airborne particle sampler used in these studies is described. The importance of man-made (pollution) nuclei in industrial areas is pointed out. The importance of nonhydroscopic nuclei at supersaturations approaching 1% was confirmed by both laboratory and field studies. A surprisingly high temperature dependence of droplet growth rate was found (growth rate at 20 C was 40 times highter than at -40 C).
APTIC-19736

CHICAGO AIR POLLUTION SYSTEMS ANALYSIS PROGRAM. AN URBAN ATMOSPHERIC DISPERSION MODEL.

Argonne National Lab., Ill., Dept. of Air Pollution Control, Chicago, Ill., and Public Health Service, Washington, D.C., National Air Pollution Control Administration. 116p., Oct. 1969. 23 refs. (Presented at the Symposium on Multiple Source Urban Diffusion Models, University of North Carolina, Chapel Hill, Oct. 27-30, 1969.) CFSTI: ANL/ES-CC-005
J. J. Roberts, E. J. Croke, and A. S. Kennedy.
Identifiers: *Mathematical modeling, *Diffusion models, Air resource management, Chicago, Urban areas, Coal, Fuel oils, Industrial emission

sources, Electric power production, Non-industrial emission sources, Operating variables, Data handling systems, Design criteria, Air pollution forecasting, Dispersion, Plume behavior, Point sources, Transport, Winds, Stability (atmospheric).

A multiple source, computerized atmospheric dispersion model designed for operational use in air resource management was formulated and programmed for the IBM 360-75 system. The model consists of a series of algorithms assembled around a kernel which represents the transport and diffusion of pollutant species from point and area sources according to a Gaussian distribution in three dimensions. This kernel, which represents a three-dimensional puff of smoke, is integrated according to a time-series of piecewise constant wind vectors and piecewise constant atmospheric stability parameters to simulate the transient behavior of a continuous smoke plume. The model is incorporated in a master air pollution data management system which is employed to store, retrieve, process, analyze, and display emission, meteorology, and air quality data. The development and preliminary validation testing of this model is described against data from a three-year, computerized inventory of sulfur dioxide air quality data recorded by the receptors of the Chicago telemetered air monitoring system. A detailed, two-year inventory of Chicago coal and oil burning SO2 emission sources was acquired, data storage formats were designed, and computer algorithms were developed to generate hourly average estimates of emissions from major utility, industrial, residential, commercial, and institutional sources. The ratio of standard deviation to mean values for all hourly SO2 predictions is 0.93 for approximately 2300 data points. (Author summary modified)
APTIC-19737

POLARIZATION OF LASER EMISSION SCATTERED BY FOG AND SMOKE.

Fiz. Atems. i Okeana (Moscow), 4 (10):1116-1119,
1968. 10 refs. Translated from Russian. Techtran
Corp., 7p., Oct. 14, 1969. CFSTI, DDC: AD
695958
M. V. Kabanov.
Identifiers: *Smokes, *Lasers, *Fog, *Light scattering, Ussr, Mathematical analyses.

The results of experimental investigations of the degree of polarization of scattered forward and reflected light are discussed, including laser-emission in artifical fog and smoke. Measurements were conducted in a 35 cu m artifical fog chamber; a flow of linearly polarized emission from a gas laser on He-Ne mixtures, wavelength 0.63 mkm, was directed into the chamber with a given scattering medium. A method of measurement was used that significantly decreased errors from the temporary instability of the substances under investigation. During dispersion of narrow laser beams, the theory of momentary scattering describes not only the dependence of scattered light intensity on optical thickness, but also the polarizing ability of scattered forward light.
APTIC-19758

SUMMARY OF PRESENT KNOWLEDGE OF THE CHEMISTRY OF AIR POLLUTION.

Preprint, American Institute of Chemical
Engineers, New York, N. Y., 20p., 1969. 11 refs.
(Presented at the American Institute of Chemical
Engineers, Annual Meeting, 62nd, Washington, D.
C., Nov. 18, 1969, Paper 12A.)
Max S. Peters.
Identifiers: *Lower atmosphere, *Chemical reactions, Sulfuric acid, Nitrogen oxides, Sulfur dioxide, Ozone, Photochemical reactions, Free radicals, Reaction kinetics, Reaction mechanisms, Thermodynamics.

An analysis of the present state of knowledge concerning chemical reactions involved in air pollution is presented. The various types of reactions, such as photochemical reactions, ozone reactions, free-radical reactions, and nitrogen-oxides-family reactions are discussed along with examples of specific reactions and reaction kinetics data. Chemistry of the lower atmosphere is discussed, as well as thermodynamic data for the various reactions. Sulfur dioxide and its potential conversion to sulfuric acid is included. Intermediate mechanisms of the reactions as related to the cause and symptoms of air pollution are considered. (Author abstract modified)
APTIC-19763

COMPUTER PROGRAM FOR PLOTTING TIME DEPENDENT DATA WITH INSTRUCTION AND EXAMPLES.

Nebraska Univ., Lincoln, Agricultural
Experiment Station, Rept. MP23, 35p., July 1969.
K. W. Brown, and Norman J. Rosenberg.
Identifiers: *Computer programs, *Micrometeorology.

A computer program which plots time dependent data from a storage matrix is described. Time, which may range from 1 hour to 16 days, is plotted on the abscissa. The program computes the intervals at which labels are placed and determines the required annotation. Data may be plotted as frequently as one observation per minute or as infrequently as one per day. The ordinate may represent any parameter with a wide range of numerical values. A single parameter may be plotted over the selected time interval, several parameters may be superimposed upon each other, or combinations of these options may be arranged one above the other on a single time axis. The program was designed with special features to facilitate the plotting of microclimatic and micrometeorological data. It is flexible enough, however, to be used for plotting other types of time dependent data. Input data may be either on cards or magnetic tape. Plots drawn in India ink are photographically reproducible for direct inclusion in reports and journal articles. Associated utility programs are described.
APTIC-19766

WIND PROFILES WHEN CLOUDS ARE LOWER THAN 300 M.

Tr. Inst. Prikl. Geofiz. (Leningrad), no. 10:3-17,
39-43, 1967. 3 refs. Translated from Russian by L.
Heenan, Foreign Technology Div., Wright-
Patterson AFB, Ohio, Translation Div., p. 23-29,
Jan. 30, 1970.
G. B. Mashkova.
Identifiers: *Winds, *Clouds, Ussr, Lower atmosphere, Micrometeorology, Lapse condition, Temperature gradient.

Systematic wind measurements made in 1964 on a 300-m tower at Obninsk were used in compiling wind profiles during periods when the area was covered by low clouds. Observations lasting two days were made once every two weeks of air temperatures and wind speeds and directions. There were 90 instances during which the ceiling was below 300 m. Wind profiles drawn for these instances fell into three categories: type 1 is characterized by a smooth increase in wind speed with height; type 2 by the existence of a maximum speed at some elevation; and the third type, by a complicated, frequently S-shaped profile. These main types of profiles are further subdivided. Type 1a has stable stratification with small lapse rates both under and within the cloud deck and has large wind speed gradients. Types 1b and 1c have larger lapse rates and lower wind speed gradients than in type 1a. On profiles of the 2a and c types, the lapse rate is of the order of 0.5 deg per 100 m under the cloud deck, 0.6-0.7 deg per 100 m at the cloud base and 0.4-0.5 deg per 100 m in the clouds. On type 2b profiles in the lapse rate is 0.96 deg per 100 m under the ceiling, decreasing to 0.5 deg per 100 m at the cloud base and in the clouds. The vertical gradient of the wind speed changes sign at the edge of the cloud base (2a), is somewhat below it (2b) and above it (2c). Type 3 profiles are characterized by sub-cloud lapse rates. (Author abstract)
APTIC-19767

ICE NUCLEI GENERATED BY STEEL MILL ACTIVITY.

American Meteorological Society, Boston, Mass.,
Proc. Natl. Conf. Weather Modification, 1st, 1968,
8p. 7 refs. (April 28-May l.)
G. Langer.
Identifiers: *Metal fabricating and finishing, *Plume behavior, *Nucleation, *Ice, Steel, Particulates, Rain, Weather modification, Cloud seeding, Silver iodide.

Airborne counts of ice nuclei of effectiveness similar to silver iodide were made near the Gary, Indiana steel mills to ascertain whether or not they are of climatic significance. Preliminary studies show that the mill in question releases ice nuclei at a rate comparable to a Skyfire AgI smoke generator. The nuclei plume was tracked for 100 miles across Lake Michigan into Michigan and showed little change in the concentration of 30 nuclei/liter. It remains to be shown whether or not these nuclei are responsible for the increase in rainfall in the LaPorte area over the last decades. Lead iodide nuclei from automobile exhaust were not detected. (Author abstract)
APTIC-19774

THE FEASIBILITY OF OPTICAL RADAR TO DETECT CLEAR AIR TURBULENCE.

Inst. of Navigation, Washington, D. C. and
Society of Automotive Engineers, Inc., New
York, Proc. Natl. Air Meet. Clear Air Turbulence,
1966, p. 55-68. 14 refs. (Feb. 23-25, Paper 660198.)
Raymond E. Zirkle Jr.
Identifiers: *Lasers, *Turbulence (atmospheric), Feasibility studies, Particulates, Winds, Light scattering.

Two ways in which optical radar might be useful for clear air turbulence detection are investigated. One method involves spectral analysis of the doppler shifted light backscattered by moving particles to provide measures of average and gust spectrum velocity components. Another method involves the mapping of particle formations arranged in the atmosphere by correlates of rough conditions. Such correlates would include wind shear, presence of the jet stream, mountain waves, temperature changes, and similar phenomena. Pulsed ruby laser optical radars were used to examine the feasibility of turbulence detection in laboratory test chambers and afield. Many returns obtained showed evidence of particle concentration variations, but none were identified as interactions with either turbulence or correlates of rough flying. Calculations and recently reported experimental evidence show that c-w laser doppler optars might eventually measure wind velocity components and gust spectra. (Author abstract modified)
APTIC-19778

MECHANISMS OF AEROSOL PARTICLE DISPERSION IN THE FREE ATMOSPHERE.

1969 (°). 13 refs. Translated from Russian.
Techtran Corp., 42p., Sept. 25, 1969. CFSTI,
DDC: AD 695511
G. M. Petrova, and A. N. Miroshkina.
Identifiers: *Aerosols, *Lower atmosphere, *Dispersion, Ussr, Particle shape, Particle size, Mathematical analyses, Ground level, Winds, Temperature gradient, Turbulence (atmospheric).

The dispersion in the free atmosphere of irregular-shaped particles 100-1000 micron in diameter from altitudes of 500-8000 meters and of spherical particles 30-100 micron in diameter from altitudes of 500-1000 meters was investigated. Luminescent sand and plastic particles were employed as indicators. The determining factor in the dispersion of large particles was gravitational settling. As particle size diminished during dispersion, gravitational settling assumed less significance and the influence of atmospheric turbulence increased. In the case of the smallest particles, the effect of atmospheric turbulence completely dominated gravitational settling. The intensity of the turbulence is determined by the wind field and the

degree of thermal stability of the atmosphere. Strong winds and unstable stratification contribute to an increase in turbulent dispersion. Empirical formulas are given which permit computation of the surface concentration of particles which have fallen from an instantaneous point source in a specific distribution according to descent velocity. An analysis of the dispersion factors in impurities of the coefficients of transverse and vertical diffusion is given. (Author abstract modified)
APTIC-19781

TEMPERATURE MEASUREMENTS OVER JOHANNESBURG.

S. African Weather Bur. Newsletter, no. 229:53-64, April 1968.
Etel Kemeny, and E. C. Halliday.
Identifiers: *Dispersion, *Temperature (atmospheric), *Johannesburg, Diurnal, Seasonal, Africa, Ground level, Lower atmosphere, Inversion.

Air temperature data for one day in summer (Dec. 20, 1965) and one day in winter (July 23, 1966) are reported from a series of measurements made over a longer period of time at a single site in Johannesburg, South Africa. The data were obtained with thermistors on and near a radio tower at heights above the ground of 5, 50, 150, 300, 450, and 600 ft; at each height, temperatures were recorded at two-minute intervals. Temperature profiles for the two days in question are given for application to air pollution studies. Profiles for the winter day show that inversion conditions lasted longer and were more marked in the 5- to 450 ft layer than in summer. However, such unfavorable periods for the proper dispersion of air pollutants occurred in summer as well. The periods seem to be short and may occur during the night or early morning. In both seasons, chances for acceptable dispersion are good if the pollutants are emitted higher than 450 ft above-ground. In general, an improvement of the dispersion situation may be obtained by releasing the effluents above 50 ft.
APTIC-19795

THE ROLE OF OXIDES OF NITROGEN IN PHOTOCHEMICAL SMOG.

Scott Research Labs., Inc., San Bernardino, Calif., 28p., June 16, 1963. 42 refs.
E. R. Stephens.
Identifiers: *Smog, *Nitrogen oxides, *Photochemical reactions, Plant damage, Eye irritation, Cracking, Rubber, Engine exhausts, Odors, Aerosols, Scattering (atmospheric), Sulfuric acid, Acrolein, Formaldehydes, Hydrocarbons, Peroxyacyl nitrates, Sulfur dioxide, Ozone, Reaction kinetics.

Chemical reactions in the atmosphere initiated by sunlight produce many of the noxious properties of smog. Formaldehyde, peroxyacyl nitrates, and acrolein, which are known to be formed in this photochemical reaction, are eye irritants. The aerosol produced by irradiating automobile exhaust has been related to the presence of sulfur dioxide. During the photolytic reaction, SO2 is oxidized to sulfuric acid which condenses to form a light scattering aerosol. Other effects of smog are plant damage, and the odor and rubber cracking due to ozone. Active components emitted to the atmosphere are nitric oxide and hydrocarbons with some participation by SO2. The first effect is the rapid conversion of NO to NO2, the rate depending on the amount and reactivity of the hydrocarbon present. With sufficient hydrocarbon, the conversion is complete, and the NO2 concentration passes through a maximum and ozone appears. Peroxyacyl nitrate is formed by reaction of peroxyacyl radicals with NO2. In the complete absence of reactive hydrocarbon the NO is only slowly converted to NO2, and NO2 decreases when photolyzed by sunlight. With 80% of the hydrocarbon removed, it seems probable that the conversion of NO would not be complete. This will have an effect on ozone concentration, since NO and ozone cannot co-exist in the same atmosphere. The decrease in peroxyacyl nitrate and aerosol should also be proportional to the decrease in hydrocarbon, since their formation is inhibited by NO. Several recommendations for further understanding of photochemical smog formation are included.
APTIC-19849

FOG OVER MILESOVKA 1956-60.

(Mlhy na milesovce 1956-60). Text in Czech.
Meteorologicke Zpravy., no. 3:78-84, 1968. 15 refs.
Milan Koldovsky.
Identifiers: *Fog, Czechoslovakia, Advection, Convection (atmospheric), Winds, Clouds, Pressure (atmospheric), Temperature (atmospheric).

Against the thirty years mean, 1910-1939, the number of foggy days on Milesovka in Czechoslovakia is rising. This may be due to the simultaneous rise in air pollutants. Fog is classified with the most consequential factors stimulating the local climate of the Milesovka-Summit. The mutual relationships between fog and temperature, pressure, wind, and synoptical weather-types were studied to determine individual types of fog. The result showed that 10-15% of the fogs go to the advection-radiative valley fogs, 25-30% are made by convection clouds, and 55-65% are made by the low clouds near the fronts. It is believed that the amount of water intercepted directly from fog is four times as high as the amount of precipitation measured by conventional means. (Author abstract modified)
APTIC-19854

EXTINCTION COEFFICIENT MEASUREMENTS ON CLEAR ATMOSPHERES AND THIN CIRRUS CLOUDS.

General Electric Co., Philadelphia, Pa. Space Sciences Lab., Contract DAAH 01-68-C-0680, TM-3, 28p., Feb. 27, 1968. 6 refs. CFSTI, DDC: AD 828644
A. Guttman.
Identifiers: *Extinction coefficients, *Clouds, *Light scattering, Urban areas, Oceans, Plains, Particulates, Lower atmosphere, Scattering (atmospheric), Ultraviolet radiation, Visible radiation.

Visible and near ultraviolet radiation passing through the telluric atmosphere is attenuated primarily by molecular and large particle scattering. Light measurements through the atmosphere must also consider the effect of clouds. An experimental investigation was carried out to determine possible differences in visible light extinction properties of continental and maritime air. Urban, desert, and oceanic atmospheres were probed by means of a stable photodiode radiometer using direct sunlight as the source. No major differences were found for the three locations. Day-to-day variations of up to 30% were found. Results of similar extinction measurements on thin cirrus clouds show a slight increase in scattering coefficient in going from 4000 to 7000 A wavelength. (Author abstract modified)
APTIC-19937

DISPERSION AND DEPOSITION OF RAGWEED POLLEN FROM EXPERIMENTAL SOURCES.

Preprint, Brookhaven National Lab., Upton, N. Y. and New York State Museum and Science Service, Albany, 36p., 1970. 17 refs.
Gilbert S. Raynor, Eugene C. Ogden, and Janet V. Hayes.
Identifiers: *Deposition, *Pollens, *Dispersion, Pollen collectors, Ground level, Lower atmosphere, Diffusion models, Plume behavior, Point sources, Winds, Micrometeorology, Turbulence (atmospheric).

The dispersion and deposition of ragweed pollen released naturally from circular area sources of four sizes and artifically from point sources were studied. Concentrations were measured by wind-impaction samplers mounted on 20-degree radii at four heights and four or five distances from the sources. Deposition was measured from greased microscope slides on the ground. Differences in dispersion patterns between point and area sources are analyzed. Normalized centerline concentrations, cross-wind integrated concentrations, plume widths and heights, and mass flux are presented as functions of distance and related to source size and meteorological variables. Deposition data are also related to distance and source size. Loss of airborne particles between sampling circles is compared to deposition over the same distances. The results are compared to those of previous studies and to theory. (Author summary modified)
APTIC-19946

CATALOGUE OF LOCAL FORECAST STUDIES.

Pamphlet 0-13, 235p., Nov. 1969.
Personal Author Not Recorded.
Identifiers: *Weather forecasting.

This pamphlet is published to inform Air Weather Service activities of local forecast studies which are already available and where they may be obtained. It will assist Air Weather Service personnel who are planning newer studies by furnishing reference to earlier studies of similar nature and to studies from various locations having analogous problems. Such studies can be used effectively for planning approaches to the local problem and selecting the parameters to be used. With few exceptions, studies listed in this pamphlet are included in the master file of local forecasting studies maintained at the USAF Environmental Technical Applications Center, Washington, D. C. Some references to studies published in magazines and research reports are included. (Author abstract modified)
APTIC-19973

CHARGE EQUILIBRIUM OF THE ATMOSPHERIC AEROSOL PARTICLES.

(Kukichu no erosol ryushi no kadenritsu to sono heiko). Text in Japanese. Nippon Genshiryoku Gakkaishi (J. At. Energy Soc. Japan), 10 (10): 554-560, Oct. 1968. 11 refs.
Toshio Sekikawa, and Hiroshi Fujiwara.
Identifiers: *Aerosols, *Particle counters, *Alpha particles, Japan, Particle size, Ionization, Isotopes.

The ratio of concentration between charged and total aerosol particles in the atmosphere is variable; this might be due partly to the fact that aerosols under natural conditions are seldom in a charge equilibrium state. A method was devised that would enable the charging ratio of the aerosol particles in the atmosphere with high nucleus concentration, and with a high degree of variation in nucleus concentration, to quickly reach the equilibrium state, but would essentially leave the particle size and concentration of the aerosol identical to the natural state. This was accomplished by exposing the sample air directly to alpha radiation, while experiments were conducted on the influence of ionized nuclei that arise in the irradiation process. From the experiments it became quite evident that for aerosol particles in the 0.01 micron range the irradiation by weak Po-210 leads instantaneously to charge equilibrium, with no change in the particle size and concentration of aerosols. It is significant that the equilibrium was quite easily achieved by passing the sample air through the measurement circuit, whereas the 'Stored Method' had to be employed formerly.
APTIC-19976

REACTIONS OF OXYGEN ATOMS AND OZONE IN AIR POLLUTION.

Intern. J. Air Water Pollution (London), vol. 10:649-663, 1966. 26 refs. (Presented at the Symposium on Photochemical Aspects of Air Pollution, Cincinnati, Ohio, April 1965.)
Edgar R. Stephens.

Identifiers: *Oxygen, *Ozone, *Photolysis, Smog, Olefins, Nitrogen dioxide (no2), Free radicals, Reaction kinetics.

Reactions of free oxygen atoms and ozone as they apply to air pollution and photochemical smog are reviewed. The factors which govern the oxygen atom and ozone concentrations are reviewed. The role played by reactions of oxygen atoms with oxides of nitrogen is discussed as it affects the determination of light intensity by photolysis of nitrogen dioxide. The relationship of these inorganic reactions to the attack on hydrocarbon molecules is discussed along with the various attempts which have been made to account for the rate of disappearance of hydrocarbon in terms of its reaction with oxygen atoms and ozone. Since most of these attempts have indicated that these two reactions fall short of accounting for the observed rate of reaction, it has been suggested that free radical attack may play a role. Some difficulties with this concept are pointed out. Experiments on the reaction of olefins with ozone have also produced discordant results. While some investigators have found an approximately stoichiometric reaction with second order kinetics (at ppm concentrations) others have reported non-stoichiometric reactions of complex order. (Author abstract modified)
APTIC-19990

ATMOSPHERIC SALT PARTICLES AND RAINDROPS.

J. Meteorol., vol. 9: 200-212, June 1952. 31 refs.
Alfred H. Woodcock.
Identifiers: *Sea salts, *Rain, Oceans, Particle size, Particulate sampling, Clouds, Chlorine compounds, Particle growth.

For rains of a given intensity, there is a definite distribution curve of number of raindrops of a particular range of diameter. Chlorinity of rains also varies with rain intensity. Recently obtained data concerning atmospheric sea salt are presented in the form of distribution curves, which show the number of sea-salt particles sampled at different altitudes, of a given weight range, plotted against the weight. A computation is made, using a salt-particle distribution curve obtained at cloud levels, in which water is added to each particle until it reaches an assumed chlorinity for a given rain intensity. Each particle is thereby increased in size and becomes a drop of a new weight. The distribution curves of these computed drops are compared to previous distribution curves for various rain intensities, and are found to be remarkably similar. This result implies that, in the process of growth, the droplets containing each salt particle grow to raindrop size through coalescence with much more numerous and relatively non-saline cloud droplets. The numbers of droplets in cumulus clouds over the sea are compared to the numbers of condensation nuclei in the sub-cloud layer and to the number of larger sea-salt particles. A method of sampling the large sparsely-distributed salt particles in the atmosphere is described briefly. (Author abstract modified)
APTIC-19991

EVALUATION OF WEATHER EFFECTS.

In: Air Pollution Handbook. P. Magill, O. Holden, C. Ackley (eds.), New York, McGraw-Hill, 1956, Section 5, p. 5-1--5-66. 102 refs.
C. A. Gosline, L. L. Falk, and E. N. Helmers.
Identifiers: *Meteorology, Industrial emission sources, Stacks, Height finding, Mathematical analyses, Statistical analyses, Ground level, Dispersion, Diffusion, Plume behavior, Turbulence (atmospheric).

Concepts of macrometeorology and applications of meteorology to air pollution control engineering are considered. Types of observations and services offered by the Weather Bureau are included. Because the rate of atmospheric dilution determines the level of pollution in a given location, methods for estimating the degree of atmospheric diffusion are of paramount importance. Air pollution surveys, theoretical and empirical methods, and wind-tunnel techniques are the three general methods available. A discussion of turbulence includes atmospheric-temperature lapse rate, wind variability, wind-velocity profile, and Richardson's number. Eddy-diffusion coefficients are presented tabularly, and formulas are cited. Factors affecting dispersion of pollution from stacks and chimneys are reviewed, such as plume behavior. Formulas are included for estimating ground-leval concentrations downwind from a source and also for estimating concentrations in the plume itself. Effective stack height is also calculated. The importance of including weather considerations in the planning of an air pollution survey and of correlating survey results with meteorology cannot be overemphasized. Analysis and interpretation of data are mentioned, including mathematical and statistical techniques. Sources of pollution, the substance and amount discharged are listed tabularly. Air pollution climatology, which might be defined as putting air pollution on a probability basis for a given region or site, is of particular value in site selection and in arriving at a satisfactory and economical solution for control problems.
APTIC-19993

MAXIMUM GAS CONCENTRATION AT GROUND LEVEL FROM INDUSTRIAL CHIMNEYS.

For primary bibliographic entry see Field 14.
APTIC-19996

OBSERVATIONS OF BUOYANT PLUMES IN CALM STABLY STRATIFIED AIR.

J. Appl. Meteorol., vol. 1:251-256, June 1962. 11 refs.
Todd V. Crawford, and Arthur S. Leonard.
Identifiers: *Plume behavior.

Buoyant plumes in stably stratified air, generated by a steady source of heat, have a definite height limit. This limit was studied in the calm, stably stratified air of an ice skating rink by using model and schlieren techniques. Observed plume heights were compared with previous results and were generally higher. A theoretical model was derived and compared to the experimental data. Theoretical generalization to non-linear temperature profiles and further studies of buoyant plumes in stable and windy conditions are necessary. (Author abstract modified)
APTIC-19998

SOME REMARKS ON SIMULTANEOUS MEASUREMENTS OF PARTICULATE CONTAMINANTS INCLUDING RADIOACTIVITY AND ISOTOPIC COMPOSITION OF PRECIPITATION.

Tellus (Uppsala), 18 (4):773-785, 1966. 16 refs.
W. Bleeker, W. Dansgaard, and W. N. Lablans.
Identifiers: *Particulates, *Trace analysis, *Rain, Europe, Clouds, Hydrogen, Oxygen, Isotopes, Radioactive radiation.

The variations in concentration of trace substances in the atmosphere are similar for different precipitation events. Results of simultaneous measurements of trace substances in rain sampled during the passage of precipitation systems are discussed. The pattern of the concentrations for particulate matter is compared with that for the oxygen (18) and deuterium isotopes. The variations in the concentration are investigated for various synoptic situations. Models of precipitation systems are presented for scavenging and for cloud formations. (Author abstract modified)
APTIC-19999

DAILY FLUCTUATION OF PHYTOTOXIC AIR POLLUTANTS IN THREE NEW JERSEY COMMUNITIES AS INFLUENCED BY CERTAIN METEOROLOGICAL PARAMETERS.

Plant Disease Reptr., 46 (3):140-144, March 15, 1962. 20 refs.
Ida A. Leone, Eileen Brennan, and Robert H. Daines.
Identifiers: *Oxidants, *Meteorology, *Nitrogen dioxide (no2), *Sulfur dioxide, Tobacco, Plant damage, New jersey, Farms, Air quality measurements, Visibility, Winds, Pressure (atmospheric), Sulfur oxides.

Concentrations of sulfur dioxide, oxidant, and nitrogen dioxide were measured daily in three New Jersey farming communities during September and October 1960. Every time the oxidant content exceeded 0.035 ppm, there was an incidence of tobacco fleck. The extent of air pollution was evaluated in each community and the data plotted against three meteorological parameters: barometric pressure, wind speed, and visibility. Results showed a direct relationship of pollution load to barometric pressure, and an inverse relationship to wind speed and visibility. Data such as these may provide a basis for an air pollution forecasting system that would indicate the appropriate time for taking control measures. (Author summary modified)
APTIC-20397

LONG PATH ATMOSPHERIC OZONE ABSORPTION IN THE 9-10 MICRON REGION OBSERVED FROM A BALLOON-BORNE SPECTROMETER.

Appl. Opt., 9 (3):565-580, March 1970. 18 refs.
A. Goldman, T. G. Kyle, D. G. Murcray, F. H. Murcray, and W. J. Williams.
Identifiers: *Spectrometry, *Ozone, *Solar radiation, Measurement methods, Balloons, Altitude, Carbon dioxide, Isotopes, Light radiation.

A balloon-borne spectrometer was used to measure the atmospheric absorption of solar radiation in the 9-10 micron region as a function of altitude. Among the spectra recorded, several were made with very long optical paths above the troposphere obtained from floating altitude while the sun set. In general, the low sun spectra showed intense absorption with a number of new absorption features which had not been observed before. These observations could be due to a number of weak ozone bands which contribute to the absorption. The combination of line by line calculation and Curtis-Godson approximation is good for using the exact line shape determined over the ozone distribution in the atmosphere. The contributions of isotopic ozone molecules to long path absorption are considered, as well as carbon dioxide bands. (Author abstract modified)
APTIC-20994

COSMIC-RAY-PRODUCED SODIUM 24 AND OTHER NUCLIDES IN THE LOWER ATMOSPHERE.

J. Geophys. Res., 75 (15):3033-3038, May 20, 1970. 18 refs.
Walter Roedel.
Identifiers: *Diffusion, *Isotopes, *Radioactive radiation, Germany, Radiation measuring systems, Mathematical analyses, Ground level, Lower atmosphere, Beryllium compounds, Soldium compounds.

The concentration of cosmic-ray-produced Sodium (24) (15) hours/ half-life) in the lower atmosphere was calculated and measured, and the production rate of this nuclide was estimated. The distribution of the specific activity was calculated for different sets of vertical eddy diffusion parameters. The concentration of Sodium (24) in the lower layers of the troposphere is sensitive to vertical eddy diffusion coefficients in the range of about 50,000 to about 3,000,000 sq cm/sec; at altitudes above 4 or 5 km, the sensitivity of the Sodium (24) concentration to eddy diffusion strength decreases. Several measurements of Sodium (24), Sodium (22), and Beryllium (7) in ground-level air were carried out. Some measurements of Sodium (24) in rain-water samples were carried out. Measurements suggest that short-lived cosmic-ray-produced nuclides are useful as tracers for atmospheric motions for a wide range of eddy diffu-

sion parameters in the lowest 4 or 5 km of the troposphere. (Author abstract modified)
APTIC-20996

CHIMNEYS AND THE DISPERSAL OF SMOKE.

For primary bibliographic entry see Field 14.
APTIC-22006

A COMPARISON BETWEEN BUOYANT VORTEX RINGS AND VORTEX PAIRS.

J. Fluid Mech. (Cambridge), vol. 7:419-432, 1960. 7 refs.
J. S. Turner.
Identifiers: *Plume behavior, Great britain, Stack gases, Stacks, Stability (atmospheric).

A method to extend earlier results for buoyant vortex rings to describe the corresponding two-dimensional case, which arises in the theory of bent-over plumes is described. It is assumed that in uniform surroundings the circulation remains constant while the buoyancy acts to increase the momentum of the pair. The behaviour in two dimensions is quite different from that in three, however; a buoyant vortex ring spreads linearly with height, whereas a buoyant pair spreads exponentially with height, or linearly with time (and therefore, in a bent-over plume, linearly with distance downwind). The theory is extended to describe the rise of buoyant rings and pairs through stably stratified surroundings having a linear density gradient. The behaviour near the maximum height reached depends critically in both cases on the relative rates at which the circulation and the momentum fall to zero. If these reach zero together, the rings or pairs will steadily increase in size and come to rest at a finite height and with a finite radius. If the circulation is nonzero when the momentum vanishes, the radius begins to decrease soon after the buoyancy becomes zero, and the vortices will therefore tend to break up suddenly and mix into their surroundings. There is a considerable increase in the final height which should be attained by vortex rings or bentover plumes if the initial circulation is increased; it is suggested that releasing smoke intermittently, rather than continuously, at high velocity might be a means of increasing the effective height of chimneys in calm conditions. When the circulation reaches zero before the momentum does, the solutions indicate that the radius becomes very large near the level of zero buoyancy. (Author abstract modified)
APTIC-22009

THE MOTION OF BUOYANT ELEMENTS IN TURBULENT SURROUNDINGS.

J. Fluid Mech. (Cambridge), vol. 16:1-16, 1963. 8 refs.
J. S. Turner.
Identifiers: *Plume behavior, *Turbulence (atmospheric), Australia, Stability (atmospheric).

A theoretical model of the motion of isolated buoyant elements in turbulent surroundings is introduced, which takes into account both the growth due to turbulent entrainment and a loss of buoyant fluid to the environment. On dimensional grounds the outflow velocity is taken to be constant and proportional to some characteristic turbulent velocity in the environment, while the entrainment velocity is proportional to the upward velocity of the element. Numerical solutions of the resulting non-dimensional equations of motion are presented, corresponding to a wide range of stabilities. Typically, an element in stable, neutral or moderately unstable surroundings at first grows and then is eroded away, but at a certain value of a stability parameter gamma elements become absolutely unstable and continue to grow and rise indefinitely. The value of gamma is extremely sensitive to the level of turbulence in the environment, which could therefore exert a controlling influence on the growth of buoyant elements in unstable conditions; large elements are more likely to grow when the level of turbulence is low. Laboratory experiments carried out in order to text one of the predictions of this theory, the form of the dependence of the height attained on total buoyancy and level of turbulence in uniform surroundings, are discussed. The agreement is good, and numerical comparison of theory and experiment suggests that the assumed outflow velocity is of the same order as, but somewhat less than, the rms turbulent velocity. (Author abstract modified)
APTIC-22010

ENGLAND IS CUTTING ITS AIR POLLUTION.

For primary bibliographic entry see Field 14.
APTIC-22051

THE 'STARTING PLUME' IN NEUTRAL SURROUNDINGS.

J. Fluid Mech. (Cambridge), vol. 13:356-368, Jan. 1962. 11 refs.
J. S. Turner.
Identifiers: *Plume behavior, Australia, Mathematical modeling, Convection (atmospheric), Clouds.

The advancing front of a buoyant plume which is being established in uniform surroundings has some properties in common with the plume, while in other respects it behaves more like a 'thermal' released from rest. Solutions for these two cases cannot be matched directly, since the dependence of velocity on height is different. A similarity solution, which is consistent with the equations describing both parts of the flow, can be obtained once it is recognized that the velocity of the front may be less than that of the steady plume. The cap moves with a constant fraction of the plume velocity at the same level, and the total buoyancy in the cap is increasing, so a modification of the simple relations for thermals is required. This prediction is verified experimentally, and numerical values for the ratio of the velocities and the rate of increase of the cap radius with height determined. The extreme front of plume cap advances at about 0.6 times the mean velocity on the axis of a steady plume, and it spreads at just over half the angle of a thermal. This implies a smaller rate of entrainment and therefore a smaller rate of dilution per unit height compared with a thermal, especially since about half of the fluid mixed into the cap comes from the plume below. The model allows one to estimate the time necessary for convection from a known steady source on the ground to lead to the formation of a cloud. (Author abstract modified)
APTIC-22065

THE ROLE OF WIND SHEAR IN HORIZONTAL DIFFUSION OF AMBIENT PARTICLES.

Quart. J. Roy. Meteorol. Soc. (London), 91 (389):318-329, July 1965. 14 refs.
F. B. Smith.
Identifiers: *Particulates, *Diffusion, *Winds, Great britain, Mathematical analyses, Plume behavior, Tracers, Turbulence (atmospheric).

A change in the wind vector with height can have a very marked effect on the diffusion of tracers. At large distances from the source of a tracer the horizontal spread of the cloud varies with time (t), provided the velocity shear is maintained over a sufficient depth of the atmosphere. This relationship is extended in two ways, firstly to all values of t, and secondly by taking into account the correlation between horizontal and vertical eddy velocities. The most significant result of the latter effect is to reduce the displacement of the plume at any level in the direction of the shear. At small times of travel, the relative spread is actually less in the presence of shear than predicted by the conventional 'Taylor' method. Horizontal spread in an unbounded free atmosphere is determined by using an equation of diffusion, and by a statistical approach. (Author abstract modified)
APTIC-22066

CONCENTRATIONS OF CHLORIDE AND DEUTERIUM IN RAINWATER AS A FUNCTION OF RAINDROP DIAMETER AND THEIR RELATIONSHIP TO RAINFALL INTENSITY.

For primary bibliographic entry see Field 03.
APTIC-22067

ON COALESCENCE IN AEROSOLS IN THE AITKEN SIZE SUBRANGE.

Preprint, 9p., 1969. 4 refs. (Presented at the International Conference on Condensation and Ice Nuclei, 7th, Prague, Czechoslovakia-Vienna, Austria, Sept. 18-24, 1969.)
Walter Carnuth.
Identifiers: *Aerosols, *Particle size, *Particle growth, Germany, Convection (atmospheric), Winds, Condensation (atmospheric), Turbulence (atmospheric).

Coalescence phenomena play a very important part in the life history of aerosol particles in the Aitken size subrange, and are crucially determinative of size distribution in this subrange. The coalescence rate is extremely sensitive to variations in particle diameter. Theoretical findings can be used to compute coalescence characteristics of natural aerosols only if the particle size distribution is given with a superior degree of accuracy - and this condition is especially hard to fulfill in the Aitken size subrange. Because of vertical mixing and turbulence, studies of coalescence must be conducted in protected areas. The results of one of these studies are discussed. The coalescence after termination of particle supply shows up as a decline in the number of particles, and as a simultaneous rise in particle diameter. (Author abstract modified)
APTIC-22073

STRUCTURE OF GROUND INVERSION IN YOKOHAMA.

Kenkyu Jiho (J. Meteorol. Res.), 21 (1):23-36, Jan. 1969. 8 refs. Translated from Japanese. Franklin Inst. Research Labs., Philadelphia., Pa., Science Info. Services, 30p., Dec. 3, 1969.
Toshio Minowa.
Identifiers: *Yokohama, *Ground level, *Inversion, Urban areas, Balloons, Temperature (atmospheric), Temperature gradient, Topographic interactions, Turbulence (atmospheric).

The results of over 300 meteorological soundings of nocturnal ground inversion layers in urban areas are analyzed. The soundings were conducted by the use of kite-balloons and adballoons in cold weather. In the outer urban area, most of the temperature inversion appeared directly upwards from the ground surface. Isothermal layers were observed up to 150 ft from the ground with the inversion elevated about this layer only on windy nights. This is due to the turbulent mixing flow, mechanically produced by windward hills or roughness in the surface layer. In the central area of the city is a heat-island, due to the artificial heat supply. The temperature profile here is characterized regardless of wind by the elevated inversion layer, with a base height which reaches higher than 200 ft. (Author abstract modified)
APTIC-22080

AIR POLLUTION IN A LONDON SMOG.

Mech. Eng., vol. 76:426-428, 1954. 4 refs. (Presented at the American Society of Mechanical Engineers Annual Meeting, New York, Nov. 29-Dec. 4, 1953.)
E. T. Wilkins.
Identifiers: *Air pollution episodes, *London, *Smog, Humans, Mortality, Bronchitis, Pneumonia, Smokes, Anticyclones, Fog, Inversion, Lapse condition, Topographic interactions, Sulfur dioxide.

The December 1952 London smog episode is discussed with respect to meteorological conditions prevailing at the time, measured smoke and sulfur dioxide concentrations, mortality, and

variations in the pattern of pollution. The incident commenced with the arrival in London of an anticyclone from the northwest. There was then an almost complete calm with an inversion of the normal temperature lapse rate; by decreasing the natural turbulence of the air, the inversion prevented the dissipation of ground-level pollution to the upper atmosphere. The Thames valley was filled with fog or smoke to a width of 20 miles or more; the depth of the fog bank varied between 150-400 ft. In central London, the smoke concentration reached 4.5 mg/cu m and the sulfur dioxide concentration 1.3 ppm. Pollutant concentrations varied according to the altitude or topgraphy of a district; the variations occurred over quite short distances. In many areas with an increased mortality, the sulfur dioxide concentration averaged only about 0.2 to 0.6 ppm. Adults over 45 and children were particularly affected by the smog, and the increased death rates among these and other groups were mainly ascribed to bronchitis and pneumonia. The death rate did not return to normal until at least three weeks from the end of the fog.
APTIC-22102

ESSA CUMULUS SEEDING PROJECT 1968. AN ATTEMPT TO DETERMINE SILVER CONTENT OF CLOUDS AND RAIN.

Miami Univ. Fla., Inst. of Marine and
Atmospheric Sciences, ESSA Grant E-22-99-68
(G), Tech. Rept. ML 69166, 9p., Nov. 1969.
H. Gote Ostlund, and Robert D. Stearns.
Identifiers: *Sampling methods, *Clouds, *Cloud seeding, *Silver compounds, Rain.

Samples of liquid water and ice were collected on the EC-121 aircraft at 17,000 ft and on the S-2D at about 2000 ft altitude. Both unseeded and seeded clouds were sampled, and samples were taken both before and after the time of the seeding run. All samples were obtained by scoop and tube systems made entirely of PVC and soft vinyl plastic, joined with PVC-cement or epoxy glue. No metal parts came in contact with the samples. The samples were frozen with dry ice immediately, or within 3 hours after acquisition, and stored at -4 C. Altogether 84 samples were collected in 17 clouds, while the sub-freezing level of a cloud, 0.5 kg silver was distributed. Silver concentration in all samples was found to be below the detection level or less than 1 ng Ag per sample. Acception of this result at face value would indicate that the seeded air parcel ascends very rapidly and that the seeding has no direct effect on the formation of rain. Indirectly the seeding would affect the condensation process through the enhanced convection. Before drawing definite conclusions, however, more experiments must be made.
APTIC-22111

THE CLIMATE OF TOWNS.

Wenner-Gren Foundation for Anthropological
Research, Inc., New York, Proc. Intern. Symp.
Man's Role Changing Face Earth, 1956, p. 584-606. 53 refs.
H. E. Landsberg.
Identifiers: *Urban areas, *Micrometeorology, Dusts, Soot, Suspended particulates, Fumes, Smog, Smokes, Visibility, Ground level, Lower atmosphere, Middle atmosphere, Electricity (atmospheric), Clouds, Fog, Humidity, Precipitation, Temperature (atmospheric), Scattering (atmospheric), Inversion, Topographic interactions, Sulfur dioxide, Solar radiation, Air pollution episodes.

The relationship between air pollution and the microclimate of a city is discussed. Almost all climatic elements are affected by pollution: radiation, cloudiness, fog, visibility, and the atmospheric electric field. In a secondary way temperature, precipitation, and humidity are also affected. The topography of a city often causes unfavorable microclimate and macroclimate conditions which contribute to the accumulation of smoke and fumes in the lower layers of the atmosphere. The microclimatic setting contributed to the October 1948 smog episode in Donora, Pa. In Los Angeles, a macroclimate of frequent temperature inversions and much sunshine has intensified the smog problem. A series of comparative analyses for sulfur dioxide showed that the centers of seven eastern U. S. cities had higher concentrations than the countrysides 25 miles away. The annual solar radiation reduction averages about 25%. This energy is partly absorbed and partly reflected and scattered by the dust haze above a city. The scattering of incoming radiation by smoke pall is indicated by observation of sky blue. Most obvious in all climatological records is the decrease of visual range in cities and towns. As cities and industrialization grew, so did the number of days with fog. The effects of air pollution on precipitation, temperature, humidity, and cloudiness are also discussed in detail.
APTIC-22123

6. BASIC SCIENCE AND TECHNOLOGY

THERMAL, RADIATION AND CHEMICAL STABILITY OF SULFUR DIOXIDE.

Oak Ridge National Lab., Tenn. Contract W-7405-ENG-26, 6p., Dec. 31, 1963. 14 refs. CFSTI:
ORNL-TM-747
R. L. Bennett, and G. W. Keilholtz.
Identifiers: *Sulfur dioxide, *Chemical reactions, *Radioactive radiation, *Temperature, Carbonyls, Carbon dioxide, Carbon monoxide, Sulfur trioxide, Sulfur compounds, Carbon disulfide, Decomposition, Dissociation.

The thermal and radiation stability of sulfur dioxide was studied, together with the chemical reactivity with some reactor materials. Sulfur dioxide is relatively stable thermally. It can be heated to 2000 C without appreciable decomposition. At high temperatures, the dissociation products are S2, O2, SO3, S, and O. Although no experimental information is available on radiation damage, it is believed that SO2 will decompose in a radiation field. This is based on the cracking pattern of SO2 for 50 ev electrons. When SO2 is passed over carbon at high temperatures, the following substances may be present: carbon, sulfur, SO2, carbon monoxide, carbon dioxide, carbonyl sulfide, and carbon disulfide. However, the type of carbon used is important. When metallurgical coke was used, very little CS2 was formed. With charcoal, the reaction began at 500 C, but was hardly noticeable at 800 C with coal.
APTIC-15587

LASERS IN THE UK, PART II: SERVICES ELECTRONICS RESEARCH LABORATORY BALDOCK, HERTFORDSHIRE.

Office of Naval Research, London, England,
ONRL-58-65, 8p., Dec. 10, 1965. 11 refs. CFSTI,
DDC: 476670
Elliot H. Weinberg.
Identifiers: *Lasers, Great britain.

Gaseous and semiconductor laser research and development at the Royal Navy's Services Electronics Research Laboratory has produced high powered far infrared and ultraviolet lasers, a molecular laser containing water vapor, argon ion lasers oscillating at 5100 A, and H-ne ring lasers. Application of the lasers to rotational sensors, distance ranging, and micromachining is discussed.
APTIC-15588

STUDIES OF THE EFFECT OF LASER RADIATION ON CHEMICAL ACTIVATION AND VAPOR FOG NUCLEATION.

Mithras, Inc., Cambridge, Mass., Contract DA-18-035-AMC-255 (A), Proj. 1C014501B71A, Rept. MC
64-110-R3, Quarterly PR-3, 23p., May 1965. 13
refs. CFSTI, DDC: 468165
Charles S. Naiman, Mary Yvonne DeWolf, and
Jack Schwartz.
Identifiers: *Lasers, *Fog, *Nucleation, Spectrometry, Organic phosphorus compounds, Decomposition, Condensation, Free radicals, Ionization, Light radiation, Liquids, Vapors.

The various effects of laser radiation on liquid systems including but not limited to dimethyl methylphosphate (DMMP) were studied; and basic information was obtained on the condensation of vapor or aerosol fogs as a result of laser radiation. Breakdown, the production of high-temperature plasma, was obtained in air, DMMP, and mixtures of air and DMMP vapors with a focused Q-switched 20 Mw laser pulse. Sequential photographs of the turbulence and eddies following breakdown in DMMP-air mixtures were obtained. Preliminary studies with a diffraction grating show that the emission spectrum is a continuum. Ionization was produced by the focused Q-switched laser pulse just below the power threshold for the breakdown. A cloud chamber was assembled with DMMP as the working material. This chamber is a convenient vessel for obtaining mixtures of DMMP vapor and air and other gases. EPR experiments with DMMP were attempted and DMMP absorbed microwave energy at K-band frequencies independent of applied magnetic field. Substitution of a slow wave structure for the cavity is expected to correct the difficulty. Since it is possible to produce breakdown in air, air mixed with DMMP, and DMMP alone, it would be practical to produce decomposition of DMMP by producing breakdown at the focus. Breakdown will be characterized quantitatively by determining the threshold and products of breakdown by the emission, NMR, and EPR spectra. The methods being used are complementary as ions, luminescence, and thermal effects are observed in the cloud chamber; free radicals can be studied by EPR and NMR techniques. (Author abstract modified)
APTIC-15589

THE IRRADIATION OF CARBON DIOXIDE CONTAINING SMALL AMOUNTS OF METHANE: THE FORMATION OF HYDROGEN.

United Kingdom Atomic Energy Authority,
Wantage (England), Isotope Research Div., 30p.,
Feb. 1969. 34 refs. CFSTI: AERE-R-604D
J. A. Hearne, and R. W. Hummel.
Identifiers: *Methanes, *Carbon dioxide, *Isotopes, *Gamma radiation, Great britain, Hydrogen, Carbon monoxide, Oxygen, Reaction kinetics.

Carbon dioxide containing 2000 VPM methane, methane-d4, or their equimolar mixture, with and without the addition of 1% carbon monoxide or 200 VPM oxygen, was irradiated with Co-60 gamma radiation at temperatures of 20-400 C and at atmospheric pressure. G-values (G equals hv/BH, where h is Planck's constant, V is frequency, B is Bohr magneton, and H is magnetic field) for H2, HD, and D2 are reported and possible reactions are discussed. H2 is formed predominatly by hydrogen atom reaction; formation from CH4 is negligible. Energy transfer from excited CO2 species to CO is postulated; this is in competition with transfer to CH4, which appears to be temperature dependent. (Author abstract modified)
APTIC-15591

THE HETEROGENEOUS DECOMPOSITION OF NITRIC OXIDE ON SUPPORTED CATALYSTS.

Atmos. Environ., 3 (2):107-122, March 1969. 23
refs.
M. Shelef, K. Otto, and H. Gandhi.
Identifiers: *Nitric oxide, *Reaction kinetics, *Reaction mechanisms, *Catalysts, Pollutants, Automotive emissions, Automotive exhausts, Mass spectrometry, Metal compounds, Aluminum compounds, Chromium compounds, Cobalt compounds, Copper compounds, Nitrogen, Carbon dioxide, Nitrogen oxides, Nitric oxide (no), Nitrogen dioxide (no2), Nitrous oxide (n2o), Oxygen, Catalysis, Catalytic activity, Chemical reactions, Decomposition.

Heterogeneous decomposition rates of nitric oxide in the temperature range from 300 to 800 are determined for a series of supported catalysts containing platinum, or the oxides of copper, chromium, and cobalt. The experiments have been carried out in a conventional integral flow reactor, and complete analyses of the gas compositions obtained by a mass spectrometer. Kinetic parameters such as activation energy and reaction order are given. A comparison is made with published data for similar catalysts, and reasons for disagreement are considered. It is concluded in view of the presently available catalysts that the practical application of catalyzed decomposition is not promising for the removal of NO from automobile exhaust. (Author Abstract)
APTIC-16817

LIGHT SCATTERING IN A SPHERICAL ATMOSPHERE CONTAINING AEROSOLS.

Atmos. Oceanic Phys. (English translation), 5 (1):23-31, Jan. 1969. 10 refs. Translated from Russian by P. A. Keehn.
O. I. Smoktiy.
Identifiers: *Aerosols, *Mathematical modeling, *Atmospheric phenomena, *Scattering, *Light radiation, Pollutants, Particulates, Mathematical analyses, Ozone.

The basic boundary value problem for finding the mean intensity of multiply scattered light in a spherical aerosol atmosphere is formulated. The numerical data obtained on the brightness of the crepuscular aerosol atmosphere are analyzed for a case when the orbit of a space vehicle is high enough, and the observer is in the shadow zone at a great distance from the terminator line. Results showed that for aerosol atmosphere models, the scattering indicatrices, theoretically computed and determined on the basis of experimental data, lead to almost identical results at heights exceeding 10 to 12 km. A pronounced difference in brightness was observed only in the lower 6 km layer of the atmosphere. Calculations of the results for absorption of solar radiation by atmospheric ozone showed a decrease in the brightness of the crepuscular aureole, and ozone exerts a substantial effect on the evolution of color of the crepuscular sky at a height of 25 to 45 km. (Author abstract modified)
APTIC-18204

A COMPARISON OF THE IEC, DUST/FOG, AND INCLINED PLANE TESTS.

For primary bibliographic entry see Field 09.
APTIC-18205

THE REMOVAL OF NITRIC OXIDE FROM COKE OVEN GAS.

Dechema Monograph, 48 (835-858):131-144, 1963. 2 refs.
M. J. Dols.
Identifiers: *Process moficiation, *Nitric oxide (no), Pollutants, Combustion products, Combustion gases, Sources, Fuels, Coke, Control methods, Process modification, Hydrocarbons, Nitrogen oxides, Peroxides, Chemical reactions.

The presence of explosive gum formed from NO reacting with the unsaturated compounds in coke oven gas may be a source of danger in the preparation of synthesis gas for the production of NH3. In the formation of the gum, NO is converted to nitric dioxide and diene peroxide. The peroxide accumulates and the nitric oxide is practically fully converted to nitrogen dioxide which reacts with dienes to form gums. By increasing the diene content (cyclopentadiene) of the coke oven gas, NO gum formation is increased, resulting in complete removal of NO. The gums formed during the reaction are washed out in benzole, CO2, NH3, and a scrubber. Another method has been developed on a small scale. In this method the NO is also removed by forced gum formation by irradiating the gas with ultra violet light. This probably causes initiation of the reaction between cyclopentadiene and O2 with formation of peroxide and NO2.
APTIC-18207

THE MEAN SPECIFIC HEAT OF GASES.

(Die mittlere spezifische Waerme der Gase.) Text in German. Feuerungstechnik (Stuttgart), 23 (8):85-86, Aug. 15, 1935. 10 refs.
Wilhelm Gumz.
Identifiers: *Gases, *Mean specific heat, Europe, Germany, Hydrocarbons, Aliphatic, Methanes, Hydrogen, Nitrogen, Carbon dioxide, Carbon monoxide, Sulfur oxides, Sulfur dioxide, Oxygen, Physical states, Water, Temperature.

Basing his calculations on two review articles by E. Justi (Forsch., 2 (4):117-124, 1931 and 5 (3):130-137, 1934), the author gives the mean specific heats at standard conditions and temperatures between 0 and 3500 C of the following gases: CO2, SO2, H2O, N2, O2, air (at 20 C and 80% relative humidity), argon, CO, H2, and CH4. Values for atmospheric air were computed for the following compositions: 21% O2, 78.05% N2, 0.92% Ar, 0.03% CO2 (dry air) and 20.597% O2, 76.554% N2, 0.903% Ar, 0.03% CO2, and 1.916% H2O (moist air).
APTIC-18209

THE OXIDATION OF NITROGEN IN COMBUSTION AND EXPLOSIONS.

Acta Physicochim. U.R.S.S., 21 (4):577-628, 1946. 19 refs.
J. Zeldovich.
Identifiers: *Nitrogen, *Oxidation, *Combustion, Sources, Explosions, Experimental methods, Mathematical analyses, Nitrogen oxides, Nitric oxide (no), Chemical reactions.

The reaction mechanisms involved in the oxidation of N2 in combustion and explosions were investigated. The results of the experiments show that the amount of NO formed in an explosion depends in the first approximation on the quantities of O2 and N2 in the explosion products and on the heat of combustion of the explosive mixture, but not on the chemical nature of the combustible material. The heat communicated in pre-heating the mixture influences the yield of NO like the chemical energy of the explosion. In all the experiments, the yield of NO was less than the equilibrium amount at the maximum temperature attained. When combustion takes place in a gas stream, NO is formed only after the fuel has completely burned. It is concluded that, since the formation of NO depends only on the high temperature of the explosion or flame and is not directly connected with the combustion process, the reaction is thermal in nature. The decomposition of NO premixed with the explosive mixture and the yield of NO in explosions of H2 mixtures were investigated. The absolute values of the velocity coefficients of the decomposition and formation of NO were determined.
APTIC-18210

DELIGNIFICATION OF KRAFT PULP IN THE FIRST BLEACHING STAGE USING CHLORINE DIOXIDE AND CHLORINE.

Pulp Paper Mag. Can. (Quebec), 67 (4):T181-T190, T204, April 1967. 25 refs.
J. V. Hatton.
Identifiers: *Chlorine, *Delignification, *Chlorine dioxide, Sources, Industrial emission sources, Chemical processes, Kraft pulping, Chlorine compounds.

The effect of progressive substitution of C1O2 for C1 on the efficiency of delignification using the new sequential first stage treatment developed by Hooker Chemical Corporation Dsubc has been studied at 20 C in the sequence DsubcEH. This process produces pulps of superior brightness and viscosity to those resulting from mixtures of chlorine dioxide and chlorine in the chlorination stage D/C for equivalent ratios of chlorine dioxide to chlorine. With the experimental conditions used in this investigation, superior delignification, as measured by permanganate number is afforded by sequential addition when the ratio of chlorine dioxide to chlorine exceeds 3:9 (based on oxidizing equivalent). When only small amounts of chlorine dioxide are used, Dsubc and D/C delignification treatments are about equivalent. The optimum application in the DsubcEH sequence was found to be in the range Dsub (60c60) to Dsub (70c50), though extremely efficient delignification and pulps of high brightness are obtained with levels of application as high as Dsub (100c20). The optimum application in the D/CEH sequence was found to be Dsub60/Csub60. The effect of modifying the basic sequential addition treatment has been studied. Delignification is not as efficient and pulp brightnesses are lower when a wash is incorporated between the dioxide and chlorine stages. The effect of varying the level of caustic soda applied in the first extraction stage on pulp brightness and permanganate number after D/C and Dsubc treatments has been studied in some detail. The results indicate that in order to reach a given brightness or permanganate number as much as 2% (based on pulp) caustic soda can be saved by using a chlorine dioxide:chlorine ratio of 60:60 compared to 30:90. A study of the variables associated with the extraction stage has indicated possible criteria for the selection of the most economical level of application of caustic soda. These results suggest that this level is a simple function of the oxidant applied in delignification. A tentative explanation for thee observed order of delignification efficiency is proposed. (Author abstract modified)
APTIC-18214

ON REACTIONS AND PROPERTIES OF NITRIC OXIDE AND ITS COMPOUNDS. III. THE REACTION BETWEEN NITRIC OXIDE AND THE ALKALI SALTS OF NITROSODISULFONIC ACID.

(Ueber Reaktionen und Eigenschaften des Stickoxyds und seiner Verbindungen, III. Mitteil: Die Reaktion zwischen Stickoxyd und den Alkalisalzen der Nitrosodisulfonsaeure.) Text in German. Chem. Ber., 66:292-297, 1933. 15 refs.
Heinz Gehlen.
Identifiers: *Nitric oxide (no), *Potassium compounds, *Reaction mechanisms, Germany, Analytical methods, Chemical methods, Nitrogen dioxide (no2), Nitrous oxide (n2o).

A new method is described for the determination of nitric bxide. If 16 g of potassium nitrosodisulfonate (ON (SO3K)2) are suspended in 100 cc of 5% KOH or NaOH (this quantity will not dissolve) and shaken with NO gas, the gas is absorbed somewhat more quickly than it would be in the usual ferrosulfate solution. The blue-violet solution becomes colorless upon becoming saturated with NO but remains alkaline. The solution turns yellow when it is acidified, but it also becomes colorless after shaking or heating, during which some NO and N2O are evolved. If ferrosulfate is added after acidification, the solution turns black-brown, indicating the presence of nitrous acid, HNO2. The nitric oxide absorption may be summarized as follows: ON (SO3K)2 + NO + NaOH yields NaNO2 + HON (SO3K)2. This is a quantitative reaction, i.e., 1 mole ON (SO3K)2 absorbs 1 mole NO. If the solution is heated to 40-50 deg and shaken 1-2 min with PbO2 a blue-violet solution is obtained after filtration of the precipitated lead hydroxide. This reaction indicates that the solution must have contained HON (SO3K)2, which was oxidized to ON (SO3K)2 by the lead. This oxidation can also be carried out with potassium permanganate, as in the Raschig method.
APTIC-18225

PLANT MORPHOLOGY.

For primary bibliographic entry see Field 08.
APTIC-18227

PLANT PHYSIOLOGY.

(Physiologie Vegetale - Action de la 8-azaguanine et de la guanine sur la croissance et la ramification du protonema de Ceratodon purpureus.)
Translated from French. C R Acad. Sci., Paris, Ser. D, p. 1381-1383, 1967. 9 refs.
Monique Gourgaud.

Identifiers: *Plant growth, Plants (botany), Proteins, Inhibition, Metabolism, Organic nitrogen compounds, Amines, Europe, France.

A ceratodon purpureue protonema grown in darkness in a composition containing glucose and 8-azaguanine (0.000032M.) in vitro loses some of its power of branching, while its lengthwise growth remains unchanged. Guanine added to the inhibiting composition in a concentration of 0.0000066M. restores normal branching. Since this phenomenon is not found in the presence of 5-FUDR, the 8-azaguinine appears to be an inhibitor of the synthesis of RNA. The 8-azaguinine has the same effect on the oblique mitosis of the ceratodon protonema as on the biodimensional growth of the prothallus fern. This favors the hypothesis of an analogy between the two phenomena.
APTIC-18228

UV-STIMULATED DECOMPOSITION OF N_2O ON MAGNESIUM OXIDE.

Kinetics Catalysis (USSR) (English translation from Russian of: Kinetiku i Kataliz), 9 (4):778-779, Part 2, July-August 1968. 2 refs.
A. A. Lisachenko, and F. I. Vilesov.
Identifiers: *Nitrous oxide (n2o), *Decomposition, *Ultraviolet light radiation, Ussr, Adsorption, Magnesium compounds, Oxygen, Photochemical reactions, Photolysis, Ultraviolet radiation.

It has been found that N_2O decomposes when the system N_2O/MgO is subjected to light with lambda equal to or less than 260 nm. During photodecomposition, nitrogen passes into the gas phase and oxygen is adsorbed on the irradiated surface of MgO and can be separated from the specimen by heating to no greater than 300 C. (Author abstract)
APTIC-18239

INTERACTION OF METAL IONS AND PHOSPHOLIPID MONOLAYER AS A BIOLOGICAL MEMBRANE MODEL.

Ind. Health (Japan), 6 (3):128-133, Oct. 1968. 20 refs.
Yasutomo Suzuki, and Hidetsuru Matsushita.
Identifiers: *Membranes, *Cadmium compounds, Cells, Lipids, Metal poisoning, Japan, Metal compounds, Calcium compounds, Sodium compounds, Chemical reactions, Ions.

The effects of Na (+), Ca (2+), and Cd (2+) on the surface pressure-area relation of the phospholipid monolayer of a biological membrane model were studied. The metal ions expanded the monolayer. The lowest ion concentration at which expansion was observed decreased in the order Na (+), Ca (2+), Cd (2+). The minimum concentration of Na (+) required for maximum expansion nearly equalled that of Ca (2+), and was larger than that of Cd (+). Therefore, the reactivity of the metal ions with the phospholipid monolayer appears to be in the order of Cd (2+), Ca (2+), Na (+). In subsolutions containing two different metal ions, the ions competed with each other for the negatively charged sites of the phospholipid molecules. Cadmium was the most reactive in competition. Its high reactivity may be related to the cadmium poison observed in workers exposed to the metal. (Author abstract modified)
APTIC-18241

REACTION KINETICS OF SODIUM BICARBONATE WITH SULFUR DIOXIDE.

(K voprosu o kinetike vaimodeystviya bikarbonata natriya s sernistym angidridom.) Text in Russian. Izv. Vysshikh Uchebn. Zavedenii Khim i Khim Tekhnol., 5 (5):770-774, 1962. 8 refs.
V. S. Yepifanov, and T. I. Kunin.
Identifiers: *Sulfur dioxide, *Reaction kinetics, *Sodium bicarbonate, Ussr, Sodium compounds, Reaction mechanisms.

The reaction of sodium bicarbonate with sulfur dioxide at 30-250 by the so-called dry method was studied. A high reaction rate occurs only when the bicarbonate dissociates somewhat to yield soda, CO_2, and water vapor. Then reaction takes place between the soda and SO_2 in the presence of water vapor. At low temperatures, reaction takes place by way of the liquid phase; at higher temperatures there is a minimum moisture content above which the reaction rate remains the same. Above 200 C the basic reaction is counteracted by decomposition of sodium sulfate to sulfate plus sodium. A yield of 95% sodium sulfate in the range of 160-200 C has been demonstrated. Production of sodium pyrosulfate at 20-60 C is possible, but is complicated by significant oxidation of the derived salt by gaseous oxygen.
APTIC-18246

REACTION OF ACTIVE NITROGEN WITH OXYGEN.

Can. J. Chem., 45 (22): 2837-2840, 1967. 16 refs.
A. S. Vlastaras, and C. A. Winkler.
Identifiers: *Analytical methods, *Nitrogen, *Oxygen, Canada, Experimental methods, Nitric oxide (no), Chemical reactions, Oxidation, Reaction kinetics, Reaction mechanisms.

The reaction of active nitrogen with oxygen is discussed. Active nitrogen was produced in a high frequency microwave discharge. Nitrogen atom concentrations were measured by using the NO gas-phase titration. Oxygen atom concentrations were determined by either the NO_2 gas-phase titration or by addition of excess NO_2. The maximum yields of oxygen atoms, estimated at different levels in a long-tube reactor by gas-phase titration with NO_2, were equal for the reactions of active nitrogen with NO and O_2. In this reactor, the maximum oxygen atom production from the oxygen reaction, determined by the amount of N_2O_3 produced with excess NO_2, was found to correspond to the NO titration value for the active nitrogen. Experiments in a short reactor showed that the validity of the analytical method based on the trapping of N_2O_3 depended on allowing adequate reaction time for the NO + NO_2 reaction to occur.
APTIC-18249

STUDIES ON ADSORPTION. PART II. MECHANISMS OF THE ADSORPTION OF VAPOURS BY UNACTIVATED CHARCOAL.

Trans. Faraday Soc., 29:458-476, 1933. 19 refs.
L. J. Burrage.
Identifiers: *Charcoal, *Adsorption, Great britain, Experimental methods, Research methodologies, Alcohols, Ethyl alcohol, Ethers, Chlorinated hydrocarbons, Carbon tetrachloride, Benzenes, Ketones, Acetone, Sulfur dioxide, Sulfur compounds, Sulfides, Carbon disulfide, Chemical bonds, Water, Surface properties, Vapor pressure.

Unactivated charcoal made from palm nut was used in a series of experiments to determine the sorption isothermals of 10 substances with dielectric constants ranging from 81 to 2 at 25C. The mechanism which governs adsorption by unactivated charcoal appears to be the capability of the vapor molecules to collect around any projection or cavity on the surface, and therefore must be confined to polar molecules. An hypothesis is advanced to cover this field of adsorption, and the swelling of charcoals examined from this viewpoint. It is concluded that the mechanism of adsorption is very complex and can be classified under a number of headings. Adsorption is proportional to the magnitude of the dielectric constant at high pressures. The removal of the surface complex, which may either increase or decrease the amount adsorbed, is more effective with substances with higher vapor pressures.
APTIC-18250

REACTIONS OF METHYL RADICALS WITH NITRIC OXIDE.

Can. J. Chem., 40:2012-2016, 1962. 18 refs.
D. E. Hoare.
Identifiers: *Nitric oxide (no), *Free radicals, *Reaction kinetics, Great britain, Experimental methods, Acetone, Chemical reactions, Photolysis, Reactions kinetics, Methanes.

The reactions of methyl radicals, produced by photolysis of acetone at 200 C, with nitric oxide were studied. Both the rate of removal of methyl radicals and the rate of disappearance of nitric oxide were used to follow the reaction. The reaction CH_3 + NO + M yields CH_3NO + M was shown to be third order, with acetone as M. Only in the presence of low concentrations of nitric oxide will the reaction $2CH_3$ yields C_2H_6 be of importance. It was also shown that the nitrosomethane formed reacts with either methyl radicals or nitric oxide. The probability of the occurrence of such reactions as CH_3CO + NO yields $CH_3CO.NO$ was shown. The rate constant found for the reaction was compared with those previously reported.
APTIC-18251

REACTION OF HYDROGEN PEROXIDE AND NITRIC OXIDE.

Nature, 195 (4838): 279-280, July 21, 1962. 7 refs.
B. J. Tyler.
Identifiers: *Nitric oxide (no), *Peroxides, *Reaction mechanisms, Great britain, Chemical reactions, Free radicals, Reaction kinetics.

It was previously predicted that hydrogen peroxide and nitric oxide would react by chain mechanism, since above 420 C. hydrogen peroxide decomposes homogeneously by a mechanism involving the radicals OH and OH_2. This prediction was verified, and preliminary investigation of the reaction was described. Reactions were examined in plane-ended cylindrical quartz vessels by continuous measurement of the nitrogen dioxide concentration and total pressure. An excess of nitrogen was present in all experiments. NO_2 was rapidly formed from H_2O_2 and NO at temperatures from 297 to 473 C. Neither a change of vessel diameter nor a change of mixing time affected the rate. A decrease in pressure indicated the presence of a minor product during the reaction, perhaps a stationary concentration of nitric acid, the effect of which was not examined further.
APTIC-18254

SPECIFIC HEAT, ENTROPY AND DISSOCIATION OF TECHNICAL GASES AND VAPORS.

(Spezifische Waerme, Entropie und Dissoziation technischer Gase und Daempfe.) Text in German. VDI (Ver. Deut. Ingr.) Forschungsh. (Berlin), 6 (5):209-216, Sept.-Oct. 1935. 28 refs.
E. Justi, and H. Luder.
Identifiers: *Dissociation, *Gases, *Thermodynamics, Germany, Spectrophotometry, Methanes, Acetylenes, Ethylene, Hydrogen, Hydroxides, Nitrogen, Carbon dioxide, Carbon monoxide, Nitric oxide (no), Nitrous oxide (n2o), Sulfur dioxide, Oxygen, Chemical reactions, Water, Heat capacity, Temperature.

New tables were computed of the true and of the average specific heats and the entropies of H_2, D_2, N_2, O_2, HD, OH, CO, NO, H_2O, D_2O, CO_2, N_2O, SO_2, and air, between 0 and 3000 C in increments of 100 deg. For CH_4, C_2H_4, and C_2H_2, the true and average specific heats are given between 0 and 1000 C in increments of 100 deg. One table gives the entropy as a a function of the ratio of characteristic temperature/absolute temperature. For computing the pressure dependence of c sub p and c sub v, the first and second derivatives of the second virial coefficient of H_2 and N_2 are given. For 13 different reactions involving the above gases, the dissociation equilibrium constants, degrees of dissociation, heats of dissociation and the fraction of the specific heats which derive from dissociation are listed. Where possible, the values were computed from the respective state sums with spectroscopically determined coefficients. This method is usually more reliable than that of Einstein and Planck.
APTIC-18256

SPECIAL FEATURES OF AUTOMATIC GAS ANALYSES BY UNBALANCED GAS BRIDGE.

Ind. Lab (USSR) (English translation from Russian of: Zavodsk. Lab.), 34 (12):1796-1799, Dec. 1968. 7 refs.
V. V. D[illegible]mbovskii.
Identifiers: *Automatic methods, *Unbalanced gas bridge, Ussr, Primary metallurgical processing, Measurement methods, Glass fabrics, Design criteria, Experimental equipment, Mathematical analyses, Ammonia, Sulfur dioxide, Decomposition, Dissociation.

A recently developed method of automatic analysis of gas mixtures based on the use of an unbalanced gas bridge is of interest in connection with the development of automatic control and production processes. This method forms the basis for a capillary-aperture gas analyzer for measurements of SO_2 concentration. The same method forms the basis for experimental-industrial prototypes of automatic ammonia dissociometers. These instruments are designed to determine the total volumetric N and H content of NH_4-N-H mixtures, formed by partial decomposition of NH_4, in the exhaust gas from metal nitriding furnaces. Operation of the bridge is based on composition-dependent differences in the resistance to flow of linear and square-law impedances connected in opposite arms of the bridge. The use of both analysis and reference gases and the need to maintain both instantaneous flow rates constant is eliminated. The use of differential manometers with pneumatic pickups for remote transmission of readings allows a gas to be analyzed without the use of electrical power. Filtration of the gas through a layer of firmly compressed fiberglass with allowance for aperture and capillary diameters up to 0.8 to 1.6 mm ensures reliable and prolonged bridge operation in analyzing industrial gases. Unbalanced gas bridges should find extensive application as composition transducers for binary and quasi-binary gas mixtures for which most existing automatic analyzers have their limitations. Bridges of this type are easy to construct in any industrial laboratory. A mathematical study of the design parameters is given.
APTIC-18259

CONDUCTOMETRIC AND KINETIC STUDY OF NITROUS OXIDE DECOMPOSITION ON REACTION ON GRANULAR GOLD FILMS.

Kinetics Catalysis (USSR) (English translation from Russian of: Kinetiku i Kataliz), 9 (5): 882-887, Part 1, Sept.-Oct. 1968. 18 refs.
V. D. Yagodovskii, and M. Garsia Fontes.
Identifiers: *Nitrous oxide (n2o), *Decomposition, *Reaction kinetics, *Gold, Metals, Ussr, Adsorption, Catalysis, Catalysts, Reaction mechanisms.

Thin granular gold films are catalytically active with respect to the decomposition of N_2O. The reaction is first order. The reaction rate of constant temperature increases with increases in the electron work function, determined conductometrically by comparing different samples of films. The activation energy decreases with increasing work function of the samples. In the course of the reaction, the surface of the metal is negatively charged on the outside. A discussion of the results shows that the limiting stage of the reaction may be the interaction between an N_2O molecule arriving from the gaseous phase and the negatively charged adsorbed O atom. (Author abstract modified)
APTIC-18260

TURBULENT FLOW OF A SUSPENSION INTO A CHANNEL.

Powder Technol. (Amsterdam), 2 (5):278-289, June 1969. 12 refs.
J. J. Stukel, and S. L. Soo.
Identifiers: *Missiles and rockets, *Mathematical modeling, *Fluid flow, *Wind tunnel, Europe, Particulates, Suspended particulates, Control equipment, Design criteria, Experimental equipment, Experimental methods, Magnesium compounds, Density.

The hydrodynamics of a suspension (10 microns magnesia in air) over the inlet of a channel formed by two flat plates were investigated for various flow velocities, plate gap widths, and mass/flow ratios of solids to air. The study was undertaken to provide a relevant model of devices for air pollution control of solid propellant rockets. Experiments were carried out in a 12 in. x 12 in. wind tunnel with flow velocities up to 120 fps, plate gap widths of 0.25, 1, and 2 in., and mass/flow ratios up to 0.1 lb particles/lb air. Primary measurements included determination of the particle and air velocities, the particulate mass flow and density distributions, and the particle size distribution as influenced by the flow response. Correlations previously used to predict boundary layer parameters were extended to turbulent motion, which exists in most air pollution control equipment. It was concluded that the density of particles is greater at the wall than at the core due to the presence of charge on the particles induced by surface contact. Moreover, the density of particles at the wall increases as the flow develops. The particle fluid interaction length was found to be a useful parameter for estimating particle slip velocity; its magnitude is insensitive to particle loading and position for a fixed inlet velocity. Similarity laws for the scaling of control equipment should include the momentum transfer number and the electroviscous number in addition to the Reynolds Number.
APTIC-18261

KINETICS OF DECOMPOSITION OF NITRIC OXIDE.

J. Chem. Phys., 21 (4):751, April 1953. 6 refs.
Frederick Kaufman, and John R. Kelso.
Identifiers: *Nitric oxide (no), *Decomposition, *Reaction kinetics, Experimental methods, Oxygen, Catalysis, Catalytic activity, Pressure.

The work of Wise and Frech (J. Chem. Phys. 20, 1726, 1952) is questioned on both an experimental and a theoretical level on the basis of the results of experiments performed on the effect of O_2 on the kinetics of NO decomposition. The supposed catalytic effect of O_2 at 1150K could not be duplicated. The results of the experiments indicated that the final gas pressure measurement was made only on N_2 and not on a mixture of N_2 and O_2. In calibration runs on mixtures of NO, O_2, and N_2, the added O_2 had no effect on the N_2 pressure and did not lead to higher pressures of permanent gas. In actual NO decomposition runs, the presence or absence of up to 20 mm of O_2 had no effect on the permanent gas pressure which was by calibration equivalent to reactor N_2 pressures of only one to three mm Hg. It is suggested that any future experiments to resolve the discrepancy avoid fractionation of the gas mixture and allow ample time for the condensation of NO, the vapor pressure of which is 0.1 mm Hg at -195.8C.
APTIC-18263

ENRICHMENT FACTOR OF A SINGLE FRACTIONATING SIEVE PLATE.

(Koeffitsient obogashcheniya odinochnoy sitchatoy rektifikatsionnoy tarelki). Text in Russian. Zh. Prikl. Khim., vol. 32:2211-2218, 1959. 14 refs.
A. A. Noskov, G. V. Burova, and P. Fel'Desh.
Identifiers: *Bubble towers, *Enrichment factor, Ussr, Mathematical analyses, Flow rates.

A dimensionless equation for the enrichment factor, which gives good agreement with experimental data, is derived for a single sieve plate of a bubble tower under foam conditions. This factor was found experimentally to be greatly affected by vapor flow rate in the column, while specific gravity and viscosity of the liquid had only a slight effect. No effects due to coefficients of molecular diffusion or vapor properties were detected. The enrichment factor was also found to be pratically independent of of the free cross section of the plate, aperture diameter and spacing, or the ratio of angular coefficients of equilibrium to working length, which is in agreement with the theoretical equation.
APTIC-19726

THERMODYNAMICS OF REDUCTION OF SULFUR DIOXIDE WITH METHANE.

(Termodinamika vosstanovleniya sernistogo angidrida metanom). Text in Russian. Khim. Prom. (Moscow), 42 (3):187-189, 1966. 8 refs.
N. G. Vilesov, and G. A. Gorbatykh.
Identifiers: *Methanes, *Sulfur dioxide, *Reduction, *Thermodynamics, Ussr, Statistical analyses, Temperature.

Results of a thermodynamic analysis for the reaction of sulfur dioxide with methane for temperatures ranging from 900-1600 K and CH_4/SO_2 ratios of 0.3-1.25 are presented. It was assumed that oxygen is absent from the system, and that reactions are irreversible when the equilibrium constant is either greater than 10,000 or less than 0.0001. Equilibrium compositions and heats of reaction are tabulated.
APTIC-19727

ENTROPIES AND HEAT CAPACITIES OF FREE RADICALS.

Intern. J. Chem. Kinet. vol. 1:221-243, 1969. 21 refs.
H. E. O'Neal, and S. W. Benson.
Identifiers: *Free radicals, *Thermodynamics, *Heat capacity, Mathematical analyses, Hydrocarbons, Recombination, Pyrolysis.

Methods are presented for rapidly estimating the entropies (S) and heat capacities (C) of free radicals from the known S and C of structurally similar compounds. The methods consist of estimating the differences due to changes in mass, vibration frequencies, spin, symmetry, and changes in rotational barriers. Tables of contributions to S and C by different frequencies over the temperature range 300-1500 K are presented to facilitate the tabulation of the above differences. Conjugated radicals, such as benzyl and allyl, are included. The greatest uncertainties in the estimates arise from uncertainties in the barriers to rotation in the radicals. The results are applied to kinetic data on the pyrolysis of branched hydrocarbons and the reverse reactions of radical recombination. Major discrepancies exist in these data which can be nearly reconciled by postulating improbably high rotational barriers of 8 kcal for CH_3 rotation in isopropyl and t-butyl radicals. Radical thermochemistry can be fitted into group schemes and tables of groups values are given for the rapid estimation of enthalpy, S, and C for different organic radicals, including those containing sulfur, oxygen, and nitrogen. (Author abstract modified)
APTIC-19730

THE COMBUSTION OF SULPHUR DIOXIDE TO SULPHUR TRIOXIDE IN THE PRESENCE OF ORGANIC FUELS.

Ann. Genie Chim., 1967:180-183, 1967. 10 refs.
C. F. Cullis, and D. L. Trimm.
Identifiers: *Fuels, *Catalytic oxidation, *Sulfur dioxide, Great britain, Hydrocarbons, Organic nitrogen compounds, Nitrogen oxides, Sulfur trioxide, Combustion.

Studies were made of the extent to which sulfur dioxide is oxidized to sulfur trioxide in the presence and absence of various fuels. In general, the conversion is very low when the fuels are saturated and unsaturated hydrocarbons and oxygenated organic compounds, except under conditions where explosion occurs. In the presence of certain nitrogen compounds however, the amounts of sulfur trioxide formed under non-explosive conditions are considerably higher. This can almost certainly be ascribed to the powerful catalytic effect of nitrogen oxides on the oxidation of sulfur dioxide, since there is some correlation between the extent of formation of such compounds and the quantities of sulfur trioxide produced. The amounts of nitrogen oxides formed appear to be dependent on the structure of the nitrogen compounds undergoing oxidation.
APTIC-19741

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THE STABILIZATION OF SULFUR TRIOXIDE.

Ann. Genie Chim., 1967: 42-46, 1967. 15 refs.
Everett E. Gilbert.
Identifiers: *Stabilization, *Sulfur trioxide, Boron compounds, Sulfates, Chemical reactions, Pressure.

Development of the art of sulfur trioxide stabilization is summarized to date from its first commercial introduction 20 years ago. The requirements of a satisfactory stabilizer are discussed, and the test procedures used are outlined. Several effective compounds react easily with sulfur trioxide, forming a number of products. It is therefore difficult to pinpoint the 'actual' stabilizer. The role of pressure treatment varies greatly with the particular stabilizer used. Although many compounds are good stabilizers for dry sulfur trioxide, very few are effective in the presence of added moisture. Compounds of boron are outstanding in this respect. Requirement for a liquid stabilizer led to the development of a synergistic mixture of dimethyl sulfate and boric oxide. Boron-containing stabilizers are not suitable for sulfur trioxide to be used with halogenated solvents. The theory of stabilization is discussed briefly. (Author abstract modified)
APTIC-19742

PHYSICAL, CHEMICAL, AND THERMODYNAMIC PROPERTIES OF OZONE.

In: Installations for Ozonizing Water. (Ustanovki dlya Ozonirovaniya Vody). Moscow, Izd-vo Literatury po Stroitel'stu, 1968, Chapt. 1, p. 9-21, 167-169. 7 refs. Translated from Russian by D. Koolbeck, Foreign Technology Div., Wright-Patterson AFB, Ohio, Translation Div., 19p., Oct. 15, 1969. CFSTI, DDC: AD 700476
V. F. Kozhinov.
Identifiers: *Ozone, *Chemical reactions, *Thermodynamics, Nervous system, Respiratory system, Toxicity, Ussr, Chemical bonds, Decomposition, Hydrolysis, Oxidation, Gases, Water, Reaction kinetics, Reaction mechanisms, Density, Ph, Pressure, Temperature.

The chemical and physical properties of ozone, and its related chemical reactions, are discussed. Pure gaseous ozone can be obtained by fractional liquefaction and distillation of a mixture of oxygen and ozone. Ozone is toxic, affecting the respiratory organs and the central nervous system. The permissible limit of ozone in air where humans work is 0.0001 mg/l. The ozone molecule is unstable and decomposes into an atom and a molecule of oxygen. From spectrographic and thermochemical data it is known that the dissociation energy of ozone is 24 kcal. Ozone spontaneously decomposes in air at normal temperatures. In pure and dry air, the decomposition proceeds more slowly. In ordinary air which is moist and contains contaminants, ozone quickly disappears; this is explained by its action on oxidizable bodies. In strongly alkaline solutions, the decomposition occurs quickly; in acid solution, ozone is more stable. The solubility of ozone in water is affected by the pH and the quantity of dissolved substances. In reactions with organic and inorganic substances, ozone acts as a strong oxidizer.
APTIC-19744

GENETIC VARIANCE AND HERITABILITY ESTIMATES FOR SCOTCH PINE: ENVIRONMENT AND AGE EFFECTS.

Pennsylvania State Univ., University Park, Center for Air Environment Studies, Grant AP00701,
Proj. NE-27, Pub. 132-69, 59p., Sept. 1969. 21 refs.
Gregory Michael Schrum.
Identifiers: *Trees, *Genetics, *Scotch pine, Age, New jersey, New york state, Pennsylvania, Statistical analyses.

Characteristics of the progeny from 27 wind-pollinated Scotch pine trees were measured at plantation ages four, five, and six, to examine the effects of nine different geographic locations and age on heritability estimates. Heritability is the most common value used by breeders to express the relationship of the genetic components to the total phenotypic variance. The experimental design for the analyses of variance, classified as a nested factorial with randomized complete blocks nested in locations, and its underlying assumptions are discussed in detail. Traits measured include needle color and needle length, total height, total number of branches in the upper three whorls, the branch angle and length of an average branch in the second whorl, and crown taper. Resulting estimates of genetic parameters should not be used directly, but several conclusions useful to tree breeders are reported. Replication in space is important so that genotype by environment interactions can be partitioned, and so that environments will be sampled adequately. Replication in time may be equivalent to replication in space for some traits, and could be substituted as an economy measure. The development of Scotch pine varieties with broad adaptability to the environments of New Jersey, New York, and Pennsylvania appears feasible. A controlled mating system would be preferable for future estimates so that the genetic relationships will be known. (Author conclusions modified)
APTIC-19745

TESTS OF SANDED GROUTS. EFFECTS OF FLY ASH IN GROUTING COARSE SANDS AND FINE GRAVELS.

Army Engineer Waterways Experiment Station, Vicksburg, Miss., TM-6-419, Rept. 5, 16p., April 1963. 2 refs.
Ralph A. Bendinelli.
Identifiers: *Grout, *Fly ash, Carbon black, Cements.

Investigations were made to determine whether a fly ash with a carbon content in excess of specification limits would measurably affect the quality of grout in which it is used, and whether a grout mixture of water, cement, and fly ash would more effectively penetrate by pump-injection the voids formed by granular materials than normal neat cement grout (without fly ash), when the fly ash has an amount of material retained on the No. 325 sieve in excess of that permitted by current specifications. Proportioning studies indicated that an addition of 25% fly ash to a portland-cement grout produced the optimum fly ash grout mixture. Injectivity test results indicated that (a) the use of the fly ash with a carbon content 8.13% in excess of specifications did not appear to affect the quality of the grout, and (b) the fly ash mixture and the mixture containing no fly ash exhibited essentially the same penetration characteristics. (Author summary modified)
APTIC-19751

DISSOCIATIVE ATTACHMENT IN CO AND NO.

Phys. Rev., 172 (l):125-136, Aug. 5, 1968. 33 refs.
CFSTI, DDC: AD 674440
P. J. Chantry.
Identifiers: *Carbon monoxide, *Nitric oxide (no), Oxygen, Dissociation, Ions, Gases, Reaction kinetics.

The electron energy dependences of the cross sections and of the ion kinetic energy distributions were measured for 0 (-) production from carbon monoxide and nitric oxide. A modified 'split' collision chamber and an ion velocity (Wien) filter were used, which permit total collection measurements as well as kinetic energy analysis and mass identification of the ions produced. Theoretical aspects are discussed, and results of the experiments are given. With carbon monoxide two reactions contribute to the single peak in the cross section, whereby carbon atoms are produced in their ground state and in their first excited state respectively. The first reaction is predominant, and known from previous work to have a peak cross section of 2.0 times 10 to minus 19th power sq cm. Normalized to this, the second reaction is shown to have a peak cross section of 9.5 times 10 to the minus 21st power sq cm. With nitric oxide, it is shown that 0 (-) production proceeds exclusively through the reaction e plus NO to yield 0 (-) plus N where N is the first excited state. No 0 (-) ions are observed corresponding to the formation of ground state N, nor is there any evidence for the production of the second excited state of nitrogen postulated by Dorman to account for the structure in the attachment cross section. (Author abstract modified)
APTIC-19757

EMISSION FROM FAR-ULTRAVIOLET PHOTOLYSIS OF N2O, NO, NO2, CO, CO2, AND O2 ~~4000-8000~~-A.

J. Chem. Phys., 48 (5):2067-2070, March 1968. 14 refs. CFSTI, DDC: AD 675086
R. A. Young, G. Black, and T. G. Slanger.
Identifiers: *Ultraviolet radiation, *Emissivity, *Photolysis, Carbon dioxide, Carbon monoxide, Nitric oxide (no), Nitrogen dioxide (no2), Nitrous oxide (n20). Oxygen, Ultraviolet spectrometry.

The emissions seen in the visible region (4000-8000A) during the photolysis of nitrous oxide, nitric oxide, nitrogen dioxide, carbon monoxide, and oxygen with xenon, krypton, argon, and mercury resonance lamps were cataloged. The photolysis vessel was a 1.5-liter flask constructed as a double Wood's horn: one horn faced the lamp; the other faced the spectrometer, which viewed the bulb at right angles to the lamp axis. The distance from the lamp window to the center of the viewing region was 14 cm. Gas was pumped through the cell at a rate of 1 liter/sec, and a diluent of 2 torr Ar or He was used. The CO, CO2, and 02 were of high purity, and the N20 was more than 99% pure; the principal impurity was N2. The NO was condensed with liquid N2, and the middle fraction was taken off during evaporation. The gases were all pased through a dry-ice acetone trap into the system. For the single experiment with NO2, 99.5% pure gas was used, and was added to the system without trapping. The lamps were all excited with a 2450-Mc/sec microwave generator. Carbon monoxide and nitric oxide photolyzed at 1470A gave fluorescence spectra where the emission is produced from the (d3delta sub v equals 7) state of CO and from a number of little-known upper states of NO. Carbon dioxide photolysis gave the 5577A line of 0 (1S) at all wavelengths from 1048 to 1470A; at the longer wavelengths, the 0 (1S) was formed in a secondary process, as there is insufficient energy available during the initial dissociation. The NO2 photolysis produced the N2 first positive bands, the NO beta bands, and 0 (1S), depending on the photolyzing wavelength. In 02 photolysis, the only emitting species was 02 (b1sigma g +) presumably formed during 0 (1D) deactivation. (Author abstract modified)
APTIC-19760

THE STRUCTURE OF RATE EQUATIONS FOR HETEROGENEOUS CATALYSIS.

Preprint, New York Univ.. N. Y., Dept. of Chemical Engineering, 32p., Feb. 1970. 10 refs.
Ronald S. Csuha, and John Happel.
Identifiers: *Mathematical modeling, *Catalytic activity, *Reaction kinetics, Isotopes, Radioactive tracers.

A mathematical model is presented for the transfer of isotopic (or tagged) atoms through the mechanistic steps of a catalytic reaction. The unidirectional velocities, when measured under certain restrictions of isotopic exchange, can be related to the unidirectional velocities of the individual mechanistic steps. From these relations, the structure of a rate equation can be analyzed in terms of experimentally determinable unidirectional velocities, and a potential factor. For a general two path reaction system, the potential factor can be factored from the rate equation if all the rate controlling steps are in one path, and if they all have the same stoichiometric number. For this case, the rate of the overall reaction can be expressed as the product of the potential factor and the forward velocity for the path. If no rate con-

trolling steps are common to both paths, and if all the rate controlling steps have the same stoichiometric number, then a quadratic equation in the velocity is obtained. In this form, the potential factor is present, but is not factorable from the rate equation. The overall rate will still be a function of only the potential factor and the experimentally determinable forward velocities of the overall reaction. The two forms of the rate equation can be used, in the correlation of kinetic data, to determine the structure of the rate equation. If the data correlate according to either one of these forms of the rate expression, then some important information about the rate controlling steps of the mechanism can be determined, even with little or no knowledge of the mechanism. In general, it is not necessary to assume a specific adsorption rate theory. Illustrative examples are included. (Author summary modified)
APTIC-19761

MERCURY 2537-A EMISSION AS A TEST FOR N2 (A 3 SIGMA SUB U PLUS) IN ACTIVE NITROGEN.

J. Chem. Phys., 48 (9):4321-4322, May 1, 1968. 14 refs.
D. H. Stedman, J. A. Meyer, and D. W. Setser.
Identifiers: *Spectrometry, *Mercury compounds, *Nitrogen, Ultraviolet radiation, Reaction mechanisms.

Nitrogen atoms were generated by microwave discharge through pure N2 or N2/Ar mixtures in an ordinary discharge flow apparatus. Values of N were determined by NO titration. Mercury vapor was added to the flow stream with a metered flow of nitrogen or argon which had been saturated with mercury at room temperature. The intensity was first order in N, Hg, and total pressure, with N2 or Ar as carrier gas. The intensity was independent of both time after the discharge and contact time with the Hg. This shows that the exciting species is being continuously generated in active N2, indicating that the Hg 2537 A emission can be used as a simple and straightforward method for following the relative concentration of the metastable nitrogen.
APTIC-19783

THERMODYNAMIC CONDITIONS OF THE FUNCTION AND EXISTENCE OF CLATHRATE COMPOUNDS.

(Les conditions thermodynamiques de la fonction et de l'existence des composes clathrates). Text in French. Societe Francaise de Chimie Physique, Paris, (France) and Union Internationale de Physique, Commission de Thermodynamique, C. R. Reunion Commun Soc. Franc. Chim. Phys., Union Intern. Phys., Comm. Thermodyn., Changement Phases, Paris, France, 1952, p. 246-248. 2 refs. (June 2-7.)
W. F. K. Wynne-Jones, and A. R. Anderson.
Identifiers: *Thermodynamics, *Clathrates, Great britain, Alcohols, Quinones Sulfur dioxide, Vapor pressure.

Several years ago, a class of compounds, clathrates, consisting of molecules of one substance within the lattice of molecules of a second substance was proposed. Thermodynamic properties of two of these compounds are reported. Two questions involved are the possibility of the existence of an equilibrium state between the gas and solid phases of such compounds and the values of the heats of formation. Clathrates were prepared of hydroquinone and sulfur dioxide and hydroquinone and methyl alcohol. Equilibrium state vapor pressures were measured and the heats of dissociation were calculated from the slope of the line of the log of the vapor pressure and the reciprocal of the temperatures. The heat of dissociation was 9.2 kcal/mole for hydroquinone-methyl alcohol and 14.2 kcal/mole for hydroquinone-sulfur dioxide. The 9.2 value is nearly equal to the heat of vaporization of pure methyl alcohol (considered as being in the solid state); the difference of approximately 1.5 kcal/mole is attributed to the difference in entropy of the alcohol in the clathrate and in the pure condition. In the case of the hydroquinone-sulfur dioxide clathrate, the difference between the heat of dissociation of the clathrate and the heat of vaporization of the pure SO2 is approximately 9.0 kcal/mole, a fact that may be related to the color of the clathrate. The clathrate is yellow while both of its constituents are colorless. It is concluded that general thermodynamic relations apply to clathrates despite their unusual structure, and the conditions for their equilibrium are quite common. The value of the heat of formation may be large or small, but there is always an entropy of formation of some importance.
APTIC-19787

CHARACTERISTICS OF AEROSOLS PRODUCED BY SODIUM FIRES. VOLUME II. COMPARISONS OF EXPERIMENT WITH A GENERAL EQUATION FOR THE COAGULATION OF HETEROGENEOUS AEROSOLS.

North American Rockwell Corp., Canoga Park, Calif., Atomics International Div., AEC Contract AT (04-3)-701, 35p., Oct. 31, 1969. 10 refs. CFSTI: AI-AEC 12878
M. A. Greenfield, R. L. Koontz, and D. H. Hausknecht.
Identifiers: *Aerosols, *Mathematical modeling, *Combustion, *Particle growth, Reactors (nuclear), Particle size, Sodium compounds, Oxygen, Temperature.

Modifications are presented of a previously reported general equation which describes the dynamic behavior of a heterogeneous population of aerosol particles. A comparison between solutions of the modified equation and experimental results is also given. In these experiments, liquid sodium at 1000 F was exposed to an environment containing 4 to 21% oxygen. Some fraction of the oxidized sodium was then released as an aerosol in a laboratory test chamber. Measurements were made of the airborne mass concentration, mass deposition rates on the floor and walls, and the particle size distribution, each as a function of time. Solutions of the general equation were obtained by use of a digital computer, and comparisons were made with experimental findings. It is concluded that the computed solutions give reasonable representation of the observations over a considerable period of time, with values of input parameters that are internally consistent. Improvements are needed in the theory, however, to give better agreement with observed time behavior of the median size by volume. A theory for explaining the plating parameter results, and tests at higher initial concentrations in a larger vessel are also required. The model is believed to be an important step in providing an analytical approach to be used in the safety analysis which describes the behavior of aerosols assumed to be released during a major liquid-metal cooled fast-breeder reactor accident. (Author introduction modified)
APTIC-19788

SOME ASPECTS OF DROPLET GROWTH THEORY APPLICABLE TO NUCLEI MEASUREMENTS.

J. Rech. Atmospheriques, 3 (1-2):33-40, 1968. 4 refs. (Presented at the Meeting International de Comparaison des generateurs et compteurs de noyaux de condensation et de noyaux glacogenes, Campistrous par Lannemezan, France, Sept. 8-23, 1967.)
J. C. Carstens, and J. L. Kassner Jr.
Identifiers: *Particle size, *Particle growth, Simulation, Droplets, Ionization chambers, Diffusion, Clouds, Nucleation.

The meaurement of nuclei spectra in expansion and diffusion cloud chambers is intimately related to droplet growth. Reliable spectral measurements depend on accurate estimates of the true saturation which in turn depends on a detailed knowledge of the time sequence of nucleation and the details of the droplet growth process. A discussion of droplet growth is presented which is valid over the size range from 10 to the minus 7th power to 0.01 cm in radius. Quasi-steady state diffusion equations adequately describe growth only if the drop is somewhat greater in diameter than a mean free path. When the drop size is such that the diameter is less than the mean free path, the growth should be described by kinetic theory. In the intermediate region, a connection is needed between kinetic and diffusion theory. A numerical solution is presented for the connection problem in drop sizes above 10 to the minus 7th cm diameter.
APTIC-19794

ANHYDROUS LIQUID SULFUR DIOXIDE.

Ind. Eng. Chem., vol 23: 743-749, July 1931. 23 refs.
Lauren B. Hitchcock, and A. K. Scribner.
Identifiers: *Sulfur dioxide, *Compressed gases, Corrosion, Chemical processing, Packed towers, Absorption, Design criteria, Combustion, Compression, Condensation, Liquids.

The manufacture of anhydrous liquid sulfur dioxide is discussed. Texas sulfur is fed into the hopper of a Glens Fall rotary burner, to which primary air is admitted. Introduction of secondary air after the burner, followed by a spacious combustion chamber with a baffle, results in practically complete burning and absorption. Extreme dryness of the fluid is necessary in order to avoid corrosion. A fan delivers the gases to the scrubbers, where the mixture enters the base of the first of a series of five packed towers. Salt water enters the top of tower 5. Cleaning the tail gases as it travels through the packing, the sea water accumulates as weak liquor underneath the tower. It is then delivered to the top of tower 4, and so on. The liquor increases in strength until it leaves the bottom of tower 1, where it is 1 to 2% SO2. The liquor is stripped in a tower called the extractor, and the future product now exists as an SO2-water vapor mixture. By alternating compression and condensation operations in successive steps, the desired liquid SO2 is obtained. Several industries have use for liquid SO2, including refrigeration, textile industries, bleacheries, and bisulfite pulp mills.
APTIC-19848

THE SOLUBILITY OF SULFUR DIOXIDE AT LOW PARTIAL PRESSURES. THE IONIZATION CONSTANT AND HEAT OF IONIZATION OF SULFUROUS ACID.

J. Am. Chem. Soc., vol. 56:2233-2238, Nov. 1934. 17 refs.
H. F. Johnstone, and P. W. Leppla.
Identifiers: *Solubility, *Sulfur dioxide, *Thermodynamics, Absorption, Ionization, Water, Pressure.

The solubility of sulfur dioxide in water was measured between 0.2 and 10.3 mm at 25, 35, and 50 deg. By means of ion mobilities and activities corrected for the ionic strength of the solutions, the ionization constants of sulfurous acid were then calculated from previously reported conductance values at 0, 10, 19, 25, 35, and 50 deg. The ratio of the molality of the un-ionized molecules to pressure obeyed Henry's law relationship and was the same for dilute as for more concentrated solutions. The free energy and heats of ionization and of solution were calculated from equilibrium constants. The total heat of absorption of sulfur dioxide in water is -10,120 cal, a value which agrees with that obtained by extrapolating reported values for concentrations between 0.0260 and 0.7356 to infinite solutions.
APTIC-19853

INFRARED SPECTRAL STUDIES OF PEROXYACETYL NITRATE (PAN). (FINAL REPORT).

Massachusetts Univ., Amherst, Dept. of Physics and Astronomy, NASA Grant NGR 22-010-042, 19p., Dec. 1969. 5 refs. CFSTI: N69-36380
Inge Fild, and D. J. Lovell.

Identifiers: *Infrared spectrometry, *Peroxyacetyl nitrate, *Decomposition, Photochemical reactions, Reaction mechanisms.

A photochemical reaction of nitrogen dioxide and organic compounds, whereby solar energy supplies the necessary irradiation, plays an important role in polluted air. Products formed in such reactions are eye irritating and damaging to plant life. In the laboratory, it has been demonstrated by infrared spectral analysis that peroxyacetyl nitrate (PAN) is one of the more significant pollutants formed in this type of reaction. It is formed through a photochemical reaction of nitrogen dioxide and 2-trans-butene. The decomposition of this was studied under two conditions: continued irradiation and in the absence of further irradiation. The rate of decomposition differed markedly in these two conditions. Different reaction mechanisms are postulated to account for this difference. Methyl radicals as intermediate reaction products may lead to methanol and methane, involving water or radicals like hydrogen and hydroxide. Formic acid is probably formed of carbon monoxide in the same way. (Author abstract modified)
APTIC-19858

RELAXATION THEORY FOR MODULATION EXCITATION OF VIBRONIC STATES.

J. Chem. Phys., 50 (2):732-736, Jan. 15, 1969. 20 refs.
Edward W. Schlag, S. J. Yao, and Hanns on Weyssenhoff.
Identifiers: *Fluorescence, *Vibronic relaxation, Electrical properties.

One method for the absolute measurement of rate constants for defined quantum states is to study their response to sharply defined pumping. Such an experiment is the observation of the relaxation process after excitation of selected vibronic levels with amplitude modulated light. The observation could either involve secondary absorption or radiative emission. A general stochastic theory is formulated for these time-defined processes, in this case,j undergoing vibronic relaxation and fluorescence emission. From the general transport matrix describing the relaxation problem by way of the master equation, the observables are an unambiguous consequence. The solution is given in a form suitable for direct computation. For this particular case, the theory predicts a phase angle in terms of a many-shot expansion, which is not restricted to exponential fluorescence decay. (Author abstract modified)
APTIC-19864

IODINE MONOCHLORIDE AS A THERMAL SOURCE OF CHLORINE ATOMS: THE REACTION OF CHLORINE ATOMS WITH HYDROGEN.

Intern. J. Chem. Kinet., vol. 1:29-43, Jan. 1969. 19 refs.
S. W. Benson, F. R. Cruickshank, and R. Shaw.
Identifiers: *Chlorides, *Iodine, *Reaction kinetics, Spectrophotometry, Hydrochloric acid, Hydrogen, Dissociation, Reaction mechanisms, Temperature.

The use of iodine monochloride (ICl) as a thermal source of chlorine atoms in known concentration is discussed with particular reference to the suppression, by large excesses of iodine, of the chain process normally associated with chlorine atom reactions. The kinetics and mechanism of the reaction of ICl with hydrogen are presented in a study covering the temperature range 205-337 C, and the following pressure ranges: ICl, 6-20 torr; iodine (I2), 3-13 torr; and hydrogen (H2), 9-520 torr. The reaction, followed spectrophotometrically in a static system, is shown to be homogeneous, first order in ICl and in H2, and inverse half-order in I2, over several half-lifetimes of the ICl, yielding hydrogen chloride as the sole product. The rate data obtained in this work are combined with the critically evaluated results of other workers in an Arrhenius plot covering the temperature range 286-730 C, and three orders-of-magnitude in the rate constant. Corrections which are often thought to be negligible become very important when extreme precision is sought, in order to demonstrate curvature of an Arrhenius plot. (Author abstract modified)
APTIC-19865

ELECTRICAL CONDUCTANCE AND DENSITY OF MELTS OF THE BINARY SYSTEMS LINO3-NANO3 AND LINO3--KNO3.

(Elektroprovodnost' i plotnost' rasplavov
dvoynykh sistem LiNO3--NaNO3 i LiNO3--
KNO3). Text in Russian. In: Fiziko-Khimicheskiy
Analiz Solevykh Sistem. D. S. Lesnykh (ed.),
USSR, Izdatel'stvo Rostovskogo Univ., 1962, p.
118-122. 8 refs
N. P. Popovskaya, P. I. Protsenko, and A. Yu.
Kirzhnerman.
Identifiers: *Nitrates, *Density, *Electrical resistance, Ussr, Lithium compounds, Potassium compounds, Sodium compounds, Temperature.

Studies were made of the binary systems LiNO3-NaNO3 and LiNO3-KNO3 at temperatures from close to liquid to 340 C, and data are tabulated for mixture intervals of 5 and 10 mole %. Isotherms for conductivity, density, and molecular conductance are plotted for temperatures of 240 and 340 C. It is concluded that the change in conductance depends on the nature of the displacing cations, regardless of the type of fusibility diagram of the system.
APTIC-19882

MASS- AND IMPULSE-BALANCE EQUATIONS OF ISOTHERMAL NONISOBARIC GAS-LIQUID PHASE-REACTORS. PART 1.

(Massen- und Impulsbilanzgleichungen
isothermer nichtisobarer Gas-Fluessigphase-
Reaktoren I). Brenstoff-Chem. (Essen), 49 (8):
238-241, Aug. 1968. 8 refs. Translated from
German. Franklin Inst. Research Labs.,
Philadelphia, Pa., Science Info. Services, 17p.,
Nov. 12, 1969.
Horst Langemann.
Identifiers: *Gas-liquid reactors, *Mathematical modeling, Germany, Chamber processing, Flow rates, Gases, Liquids, Pressure.

Proceeding from a one-dimensional kinetic model of an isothermal gas-liquid phase, counterflow reactor, the mass balances of the reaction components for the gas phase and the liquid phase, as well as continuity equations of both phases and the reaction space, are formulated. In addition, impulse balances of both phases and the reaction space are derived. The impulse-balance equation for reactor space and the continuity equations for gas and liquid phases are used to obtain differential equations for static pressure in a cross section of the reactor and the relative volume share of the gas phase. By deriving impulse-balances to the gravitational and compression force, the equations for the static pressure are simplified to an inhomogeneous, linear differential equation of the first order. By integration, static pressure as depending on the lenght of the reactor can be obtained. Moreover, the differential equations can be transformed into equations for determining the mean relative volume shares of the gas and the fluid phases in any given segment of the reactor. The relations set up for gas-liquid phase reactors can be modified, in the case of constant volume shares by introducing the mass density and the relative volume share of the mixture of liquid and solid to apply to gas-liquid phase reactors with a suspended solid content. (Author summary modified)
APTIC-19890

A NEW METHOD OF DETERMINING THE REACTING CAPABILITY OF ORGANIC SUBSTANCES.

(Novyy metod opredeleniya peaktivosposobnosti
organicheskikh veshchesv). Text in Russian.
Azerb. Neft. Khoz., no. 12:60-68, 1936.
O. G. Pipik.
Identifiers: *Benzenes, *Chemical reactions, Ussr, Sulfur compounds, Reaction mechanisms.

A new reagent called 'active amilene fraction' was prepared and used to determine the reacting capability of organic substances. This determination is based on comparison of sulfonic index: the lower the index, the greater the reacting capability of the organic compound. This index may be useful in dealing with a number of problems in organic chemistry: the mutual effect of radicals and atoms within molecules, inhibition of certain reactions, relationships between color and structural differences among isomers, and so on. Sulfonic indices may serve to determine predisposition of petroleum products toward oxidation, and to determine the stability of benzenes, oils, and other petroleum products. So-called 'normal' indices were established experimentally for numerous benzenes and oils, and these may be used to judge the purity and stability of test samples. The sulfonic method is expected to be useful in studying the resin-forming components of benzenes and oils.
APTIC-19895

ANALYSIS OF THE NON-POLAR FRACTION OF GIANT RAGWEED POLLEN: CAROTENOIDS.

Preprint, Public Health Service, Cincinnati, Ohio,
National Air Pollution Control Administration,
35p., 1970. 24 refs.
E. Wittgenstein, and E. Sawicki.
Identifiers: *Carotenoids, *Pollens, *Chemical composition, Lipids, Allergies, Hayfever, Esters, Oxidation, Photooxidation, Fluorescence.

To understand and control hayfever and other respiratory allergic reactions, the composition of pollen in terms of its prominent constituents must be determined. The values for some of these could be used as quantitative indicators of the presence of pollen and its products in the air. The composition of ether extractable material of giant ragweed pollen was studied. Giant ragweed pollen contains about 16% of total lipids by weight. It was determined by spectrometry and thin-layer chromatography that .06% of the fat soluble pollen extract consisted of carotenoid esters. After alkaline hydrolysis, two xantophylls and a small amount of carotine were recovered from the unsaponifiable fraction. Additional chromatographic fractions were tentatively identified as steroids, sterol esters, fatty acid esters, and glycerides. Fresh ether extracts of airborne particulate samples from ragweed infested areas showed absorption bands corresponding to bands found in pollen spectra. These bands were not present in urban air particulate extracts. Photooxidation and air oxidation of carotenoids were observed on thin-layer chromatographic plates. Development of fluorescence from nonfluorescent carotenoids was observed on thin-layer plates and in solution. The originally nonfluorscent carotenoid spots absorbed at 320 nm and emitted at 530 nm. (Author abstract modified)
APTIC-19945

HETEROGENEOUS CATALYSIS WITH A SINGLE OVERALL REACTION.

J. Res. Inst. Catalysis, Hokkaido Univ., 16 (1):305-322, July 1968. 24 refs.
John Happel.
Identifiers: *Mathematical modeling, *Heterogeneous catalysis, United states, Trace analysis, Mathematical analyses, Catalysis, Reaction kinetics.

Rate equations were developed for describing heterogeneous catalytic reactions having a single

overall reaction but involving more than one slow step. Treatment of the problem assumes the existence of a steady state in which the amount of intermediates in a system does not change with time, while the overall rate at steady state is characterized by the appearance or disappearance of any single species appearing in the overall chemical reaction. Rate equations were applied to published experiments in which forward and backward rates were determined with isotopic tracers. The results constitute an extension of the stoichiometric number concept originated by Horiuti. According to this concept, an important characteristic of any single overall reaction is the stoichiometric number for each of the elementary steps, the stoichiometric number for an elementary reaction representing the number of times it occurs for each time the molecular change represented by the overall reaction occurs once. The rate expressions presented should be of general value even for situations where nonuniform surfaces or surfaces with interaction between absorbed species exist.
APTIC-19950

THE REACTIONS BETWEEN 02 (1 DELTA G) AND TETRAMETHYLETHYLENE AND 2,5-DIMETHYLFURAN IN THE GAS PHASE.

Chem. Commun., no. 21:1315, Nov. 6, 1969. 6 refs.
A. D. Broadbent, W. S. Gleason, J. N. Pitts Jr., and E. Whittle.
Identifiers: *Oxygen, *Gases, *Tetramethylethylene, Ethylene, Chemical reactions, Water, Vapors.

In a study of the reactions of 02 (1 Delta g) with tetramethylethylene (TME) and 2,5-dimethylfuran (DMF) vapors, 02 was passed through a microwave discharge and the vapors then injected into the gas stream. The products were trapped with liquid nitrogen and analyzed by gas liquid chromatography and with infrared cells. The product of the reaction of 02 and TME was a hydroperoxide with intense bands at 3594 and 906 reciprocal cm. About 50 mole% of TME was converted into the product. The reaction between 02 (1 Delta g) and DMF yielded a product (II) thought to be formed via an unstable ozonide. For the gas-phase reaction, DMF was injected in the 02 stream with the discharge off, and the observed ir spectrum of the stream was identical with that of the DMF vapor. With the microwave discharge on, new bands appeared at 1134 and 1131 reciprocal cm. They are tentatively assigned to the ozonide. About 50 mole% of the DMF was converted to II, which is estimated to have purity above 80%.
APTIC-19951

SOME CONSEQUENCES OF THE CONSERVATION OF ANGULAR MOMENTUM IN CHEMICAL KINETICS.

J. Am. Chem. Soc., 90 (8):2152-2153, April 9, 1969. 10 refs.
Sidney W. Benson.
Identifiers: *Reaction kinetics, *Angular momentum, *Fission reactions, Photolysis, Pyrolysis.

Unimolecular fission reactions in which two radicals are formed have a 'loose' transition state in which the largest moments of inertia of the reactant molecule are appreciably larger than they are in the ground state. One consequence of this is that the rate constants for such reactions tend to be faster, both at the high- and low-pressure limits, than those for tight transition states. A further consequence is that the average reacting molecule undergoing fission is rotationally 'hot'. This effect is seen in the photolysis of nitrogen dioxide, in which NO_2 can be photodissociated into nitric oxide + oxygen by 4047 A, which is about 1.3 kcal lower in energy than the bond dissociation energy. In pyrolysis, rotational energy has a special contribution to bond breaking. For example, in the pyrolysis of ethane to 2 CH_3 at 1000 K, the reactant C_2H_6 molecule contains about 10 kcal of internal rotational energy and at least 78 kcal of internal vibrational energy which do not exchange with each other. The quenching or stabilization of the rotationally hot species is more likely to be rotational than vibrational in nature.
APTIC-19953

THERMOCHEMISTRY OF OXIDATION REACTIONS.

Advan. Chem. Ser., no 75:288-294, 1968. 18 refs.
S. W. Benson, and R. Shaw.
Identifiers: *Peroxides, *Chemical bonds, *Oxidation, *Thermodynamics, Hydrocarbons.

Heats of formation (kcal/mole) were calculated for the following dimethyl, diethyl and di-tert-butyl peroxides: MeO, +3.5; EtO, -4.0; tert-BuO, -21.6; and tert-BuO2, 18.6. From the radical heats of formation, the following bond strengths (kcal/mole) were obtained: RO--H, 104 plus or minus 1; R--OH, 91.5 plus or minus 1; R--OMe, 81 plus or minus 1; R--O, 89 plus or minus 1; R--02R, 69 plus or minus 1; and R--O2, 26 plus or minus 1, the variance depending on R. Some unusual trends with X in the bond strengths ME--X, Et--X, iso-Pr--X, and tert-Bu--X are discussed. Standard bond dissociation enthalpies are also presented for some oxide and polyoxide molecules and free radicals. (Author abstract modified)
APTIC-19954

A METHOD FOR A SEMIAUTOMATIC WATER SUPPLY FOR PLANT CULTURES IN EXPERIMENTAL VESSELS.

(Ein Verfahren zur halbautomatischen Wasserversorgung von Pflanzenkulturen in Versuchsgefaben). Z. Pflanzenernaehrung, 124 (2):126-129, 1969. 1 ref. Translated from German. Belov and Associates, Denver, Colo., 5p., May 15, 1970.
G. Scholl.
Identifiers: *Water supply method, *Plants (botany), Ceramics, Germany, Experimental equipment, Water, Pressure.

A device to automatically water plants in pot-type containers is described. Previous methods provided water on the basis of weight, but they are not practical for widespread experimental stations at external locations. The method described involves the use of ceramic cylinders to be used as suction fixtures operating in a negative pressure metering device. Pressure develops because of evaporation between the soil and the cylinder. At a proper hydrostatic connection between the supply container and the ceramic cylinder, water replenishment is automatic. Water has been supplied for as long as 14 trouble-free days by this method. (Author aostract modified)
APTIC-19967

ELECTRODE PROCESSES WITH THE PARTICIPATION OF SULFUR DIOXIDE IN A STRONGLY ACID MEDIUM.

(Elektrodnyye protsessy s uchastiyem dvuokisi sery v sil'nokisloy srede). Text in Russian. Elektrokhimiya, 4 (6):741-745, 1968. 11 refs.
A. G. Voloshin.
Identifiers: *Sulfur dioxide, *Electrolysis, Ussr, Polarographic methods, Hydrochloric acid, Sulfuric acid, Sodium sulfite, Oxidation, Reduction, Ph.

Cathode and anode I-E (t) polarograms (where I is the current; E, the voltage, and t, the time) of the electrolysis of sulfur dioxide were recorded at pH values of 3 to -0.3 using c.p. reagents sodium sulfite, hydrochloric acid and sulfuric acid. In the pH range 1.4-3, peaks were seen for the reduction of SO_2 (H_2SO_3) and oxidation of the product formed back to SO_2 (H_2SO_3). At lower pH, especially below 1.1, a variety of traces were obtained and possible interpretations of these are presented.
APTIC-19984

METALLURGICAL ASPECTS OF THE CRYOGENIC STORAGE OF HYDROCARBONS.

World Petrol. Congr., Proc., 7th, Mexico City, 1967, p. 125-138. 46 refs. (vol. 6.)
F. J. Radd, L. H. Wolfe, and L. H. Crowder.
Identifiers: *Storage facilities, *Metals, *Supercooling, Natural gas, Compressed gases.

The low-temperature behavior of metals and alloys is examined for the purpose of handling and storage of cryogenic hydrocarbons. In particular, the metallurgical factors involved in fracture-safe, economical alloy designs are studied. Examples are given of the principal types of microstructures now being employed, and specific recommendations are listed for different materials classes proposed for cryogenic hydrocarbon service. New materials research data are presented on the most representative, currently-used alloys. Finally, some unsolved materials problems are defined for future research. (Author abstract)
APTIC-19989

INVESTIGATIONS ON THE RATE OF THERMAL DISSOCIATION OF SULFATES OF CALCIUM, POTASSIUM, AND SODIUM, ALONE OR IN THE PRESENCE OF ADJUVANTS; STRONGLY ACCELERATING ACTION OF WATER VAPOR.

(Recherches sur la vitesse de dissociation thermique des sulfates de calcium, de potassium et de sodium, seuls ou en presence d'adjuvants; action fortement acceleratrice de la vapeur d'eau). Text in French. Helv. Chim. Acta, 32 (85):635-646, 1949. 20 refs.
E. Briner, G. Pamm, and H. Paillard.
Identifiers: *Sulfates, *Dissociation, *Reaction kinetics, Europe, Calcium sulfates, Potassium compounds, Sodium compounds, Vapors, Thermodynamics.

The rates of thermal dissociation of calcium sulfate, potassium sulfate, and sodium sulfate were determined, to assess the use of thermodynamic formulas to predict the effect of increased temperature or the addition of adjuvants on the rate of dissociation and to verify the strong accelerating effect of water vapor on that rate. The apparatus used in the dissociation test and the preparation of the three sulfates and of silica, kaolin, and bauxites used as adjuvants were described in a previous paper SO_2 with traces of SO_3 released upon decomposition of the sulfates, were absorbed in a known volume of 0.1 N caustic soda. The latter was titrated with 0.1 N hydrochloric acid in the presence of phenolphthalein to determine the amount of SO_2 absorbed. The results of dissociation are expressed in terms of the percentage of the sulfate which had dissociated in the course of one hour at the specified test conditions. The rates of dissociation at different temperatures between 400 and 900 C and with different adjuvants and without or with H_2O vapor are listed. Silica and, particularly, metakaolin (obtained by calcination of kaolin at 800 C) increased significantly the rate of dissociation of the sulfates. The effect of H_2O vapor was very strong, also, in the presence of the adjuvants.
APTIC-20438

PERFORMANCE OF 5083 AND 7039 ALUMINUM ALLOYS IN VESSEL BURST TESTS AND NOTCHED TEST PANEL TESTS AT -220 F.

(Inst. of Gas Technology, Chicago, Ill., Proc. Intern. Conf. LNG, 1st, Chicago, Ill. 1968, 21p. 8 refs. (April 7-12, Session no. 5, Paper 26.)
R. L. Lake, F. W. DeMoney, and R. J. Eiber.
Identifiers: *Construction materials, *Aluminum, *Compressed gases, *Storage facilities, Cracking, Natural gas, Surface properties, Temperature, Tensile strength.

Aluminum alloys 5083-O and 7039-T61 were studied by linear elastic fracture mechanics for capability as pressure vessels intended to contain liquefied natural gas at -200 F. Fabricated for pres-

sure tests were three bottle shaped vessels GMA welded from 1-inch thick 5083-O plate and three GMA welded from three-fourths-inch thick 7039-T6151 plate. Pre-flaws, simulating through and part-through cracks, were cut into the material, and fracture toughness values were calculated from tests to destruction by internal pressurization with gaseous nitrogen after the iso-pentane filled vessel had been cooled from -210 F to -235 F by liquid nitrogen. Tensile tests of panels up to 12-inches wide with notches in the plate and weld were tested to -250 F and in some cases to -320 F. Both alloys are tolerant of quite large flaws at temperatures down to -220 F. and test data and a long service recorded indicate that carefully designed and constructed pressure vessels of 5083-O can be operated at stresses considerably higher than the ASME Boiler and Pressure Vessel Code maximum. Alloy 7039-T6151, although less tough than 5083-O, can be used too at higher operating stresses, provided flaw sizes are small in the presence of yield stress fields. Toughness of the weld metal will generally determine the size of the smallest critical flaw. Temperature has very little effect on the static load-carrying ability of sharply notched panels in the range from room temperature to -320 F, and tests on panels of a size which can be handled in the average laboratory appear to be of little aid in obtaining quantitative toughness data on materials as tough as 5083-O and 7039-T6151. Studies conclude that critical flaw lengths provide a valid, quantitative measure of the ability of a material to resist crack propagation in a given structure. (Author abstract modified)
APTIC-20469

CONSIDERATIONS FOR LNG PIPE MATERIAL SELECTION.

Inst. of Gas Technology, Chicago, Ill., Proc.
Intern. Conf. LNG, lst, Chicago, Ill., 1968, 19p. 17 refs. (April 7-12, Session no. 6, Paper 42.)
A. R. Duffy, and J. Dainora.
Identifiers: *Construction materials, *Transportation, *Compressed gases, Cracking, Natural gas, Pressure, Temperature, Tensile strength.

Fracture toughness data are discussed from both initiation and propagation viewpoints in the expected range of liquefied natural gas (LNG) pipeline temperatures and pressure. The temperature profile can be expected to range somewhere between the liquefaction temperature on natural gas at atmospheric pressure (-260 F) and the critical temperature (-116 F) above which liquid cannot be maintained; but the actual temperature profile depends upon transmission distance and the amount and type of insulation used. A pressure vessel is created and notched, and timing wires are spread along the pipe to measure fracture speeds. Thermocouples are mounted on the pipe, and the test specimen is filled with liquid nitrogen leaving a small gap to accommodate increase in volume and storage energy under pneumatic pressure. The critical stress intensity factor, Kcr, can be calculated from test data and, holding Kcr constant, the critical crack length versus failures stress curve is obtained. Fracture propagation depends upon the type or nature of fracture and the decomposition characteristics of the pressuring medium. In a subcooled system, it is possible for local stress to decrease abruptly while the fracture is in the process of accelerating; thus the crack is prevented from propagating.
APTIC-20480

CLASSIFICATION AND CHARCTERISTICS OF DUSTS.

(Dasuto no shurui to seijo). Text in Japanese.
Kukichowa To Reito (Air Conditioning Refrig.), 9 (1):65-69, Jan. 1969.
Kikuji Kimura.
Identifiers: *Dusts, *Surface properties, Humans, Respiratory diseases, Carbon black, Japan, Urban areas, Particulates, Fly ash, Fumes, Mists, Smokes, Particulate classifiers, Particle shape, Particle size, Electron microscopy.

Aerosols in the atmosphere fall into the category of dusts, fumes, smoke, fog or mist, and ash. In the case of smog, it is not yet clear whether the fog particles are formed around the smoke particles, or both the fog and the smoke particles exist side by side, or the fog particles are formed first and are subsequently polluted by smoke. Many industrial sources of particulates are tabulated, ranging from mines to breweries. In industry, weight (mg) per cubic meter is the usual way to express the density of airborne particles due to the close connection of this mode of expression with the studies of human lung disorders. Optical and electron micropgraphs of dusts demonstrate that different occupational environments contain differently shaped dust particles, and is known that inhaling these particles lead to illnesses such as pneumoconiosis, acute pneumonia, lung edema, chronic bronchitis, poisoning and allergies. Fluctuations in the dust particle concentration over a 24-hr period in winter are presented for strong and weak wind conditions, and the electron micrograph of a sample taken on a heavily travelled street shows that dust particles are composed of an aggregate of carbon less than 0.1 micron in size. The analysis of dust particles collected in a private home shows that they are mainly composed of sand and fibers (vegetable) and other components.
APTIC-22018

METHANATION OF CO ON A NI CATALYST.

J. Catalysis, 18 (1):118-119, July 1970. 2 refs.
Peter Schoubye.
Identifiers: *Methanation, *Nickel, *Carbon monoxide, Europe, Adsorption, Ethylene, Hydrogen, Catalysts, Chemical reactions, Hydrogenation, Reaction kinetics, Reaction mechanisms, Pressure.

The methanation of carbon monoxide on a nickel catalyst is discussed. A mechanism for the reaction is proposed, with the rate of hydrogen adsorption being the rate determining step. Experiments in a pressure range extended from 1-15 atm to 110 atm indicate that the pressure dependence at high pressure actually approaches proportionality to the square root of the total pressure (at constant CO concentration). Two hypothetical forms of active hydrogen are possibly formed with different preference on different crystallographic planes and are distinguished physically from one another. The rate of hydrogenation ethylene on a catalyst is already large at about 60 C, which indicates that the absorbed active hydrogen states are not involved in the reaction.
APTIC-22035

A CYCLIC PROCESS OF SULPHURIC ACID MANUFACTURE AT TRAIL, B. C.

Can. Chem. Process, vol. 31 1110-1114, Dec. 1947. 2 refs. (Presented at the C.I.C. Meeting, Banff, Ontario, June 8-11, 1947.)
A. F. Snowball.
Identifiers: *By-product recovery, *Sulfuric acid, Corrosion, Canada, Coke, Contact processing, Fans (blowers), Packed towers, Spray towers, Absorption, Sulfur dioxide, Sulfur trioxide, Oxygen, Catalysis, Cooling, Temperature.

In a cyclic process of sulfuric acid production, pure sulfur dioxide and oxygen are fed to a circulating gas stream that is moved by centrifugal blowers through heat exchangers to cylindrical steel converters packed with vanadium catalyst. The converted gas containing sulfur trioxide at high temperature is first cooled in the heat exchangers, then in air-cooled pipes before entering absorber towers where the sulfur trioxide is removed in contact with 98.4% sulfuric acid. The cycle is complete when the gas passes through spray catchers and coke filters back to the blowers. Measured quantities of oxygen and 100% sulfur dioxide gas are added during and after absorption, replacing sulfur trioxide and bringing the gas concentration back to the ideal operating percentages of 25% sulfur dioxide, 30% oxygen, and 54% nitrogen. Control of catalyst temperature in the converter is reviewed, as are the steps taken to prevent metal corrosion. Efficiency of the plant, which is operated by one attendant through centralized control, is 99.5%.
APTIC-22055

CANADIAN SULFUR ON THE WAY.

Chem. Ind. (New York), vol. 63:960, Dec. 1948.
Herman W. Zabel.
Identifiers: *By-product recovery, *Sulfur dioxide, *Sulfur compounds, Paper manufacturing, Nickel compounds, Iron oxides, Oxygen, Temperature.

Elemental sulfur, the most convenient form for production of sulfur dioxide, does not occur in Canada. However, two new processes are under consideration to meet the sulfur needs of the pulp and paper industry. One process will produce liquid sulfur dioxide by roasting pyritic nickel ore with oxygen. With the oxygen, the heat of combustion of the sulfur content of the ore is sufficient to raise temperatures to those required for smelting. Another advantage of the process is a gaseous product containing 70% sulfur dioxide. With the 70% gas, 75% sulfur dioxide content is removed at 120 psi by means of a water-cooled condensor. Gases containing the residual sulfur dioxide will be blown into the entrance flue of an adjacent sulfuric acid plant. In the other process, pyrites are roasted on a slowly traveling hearth. Vaporized elemental sulfur is condensed, leaving a gas high in sulfur dioxide. Iron oxide residue from the roasting operation is sintered to produce a suitable blast furnace charging stock.
APTIC-22063

DIFFUSION OF IDEAL GASES IN CAPILLARIES AND POROUS SOLIDS.

Am. Inst. Chem. Engrs. J., 8 (1):113-117, March 1962. 10 refs.
D. S. Scott, and F. A. L. Dullien.
Identifiers: *Diffusion models, *Gases, Canada, Pressure.

The steady state diffusion of gases through capillaries or through the pores of a solid when the total pressure in the system is constant is considered. The ratio of the molar diffusion rate of the lighter gas to that of the heavier gas must be equal to the square root of the ratio of the molecular weight of the heavier to the lighter. From simple momentum transfer considerations, a diffusion equation is derived to describe the diffusion rate as the nature of the process changes from ordinary mutual diffusion to Knudsen diffusion. This equation gives good agreement with experimental measurements of diffusion rates in porous solids. A structural parameter of the porous solid, the diffusion ratio, is calculated from the experimental results and compared with the experimental value of the same ratio found from electrical ratios and from flow measurements. (Author abstract modified)
APTIC-22093

OPTIMALIZATION OF A SULFURIC ACID PLANT WITH THE AID OF A COMPUTER.

(Optimalization d'une usine d'acid sulfurique a l'aide d'un ordinateur electronique). Text in French. Ann. Genie Chim., 1967:206-214, 1967. 28 refs.
Georges Honti.
Identifiers: *Chemical processing, *Computer programs, *Sulfuric acid, Europe, Operating variables.

A computer program to optimalize industrial plant capabilities is presented. The program is of a general nature and can be adapted to every process and every actual factory. The individual blocks are also universally applicable and can be adapted to actual conditions and data. In the case of calculations relating to a sulfuric acid factory, the only problem is that of the catalytic converter, and the corresponding optimalization program is drawn up. A simplified version, used for checking

purposes without optimalization, enables the activity of the catalyst to be checked as a function of the data relating to temperature, concentration, and linear velocity measured in the converter. Working with industrial and laboratory measurements, this program can be used to check the validity of a large number of kinetic equations. The results of some of these calculations are described. (Author abstract modified)
APTIC-22098

OXIDATION-REDUCTION POTENTIAL OF THE SYSTEM TITANIUM (2+)/ TITANIUM (3+) POTASSIUM CHLORIDE-SODIUM CHLORIDE MELT.

(Okislitel'no-vosstanovitel'nyy potentsial sistemy Ti (2+)/Ti (3+) v rasplave KCl--NaCl). Text in Russian. Ukr. Khim. Zh., 29 (1-6):600-604, 1963. 19 refs.
B. F. Markov, and B. P. Podafa.
Identifiers: *Oxidation, *Reduction, *Titanium compounds, Ussr, Chlorides, Potassium compounds, Sodium chloride, Chemical bonds, Electrical properties.

Potentiometric titration of titanium trichloride with metallic titanium in a potassium chloride-sodium chloride melt was studied at 700 C. Experimental data yield a formal oxidation-reduction potential of 1.807 plus or minus 0.008 volts on the chlorine scale. The ratio of coefficients of activity for trivalent and divalent titanium at 700 C is 0.0159 based on standard and formal oxidation-reduction potentials. This indicates that in solutions of potassium and sodium chloride, trivalent titanium is bound in more stable complexes than is divalent titanium.
APTIC-22100

MOLAR VOLUMES OF MELTED MIXTURES ZINC CHLORIDE ALKALI METALS CHLORIDES.

(Mol'nyj ob'yem rassplavlennykh smesej khloristogo tsinka s khloridami shchelochnykh metallov). Text in Russian. Ukr. Khim. Zh., 29 (7-12):945-946. 1963. 2 refs.
B. F. Markov, and S. V. Volkov.
Identifiers: *Chlorides, *Metal compounds, *Molar volumes, Ussr, Cesium compounds, Lithium compounds, Potassium compounds, Sodium chloride, Zinc compounds, Chemical reactions, Reaction mechanisms, Density.

Molar volumes of melted binary systems ZnCl2-(Li, Na, K, Rb, Cs) Cl were determined from density measurements. The difference between molar volumes experimentally determined and molar volumes calculated under the assumption of additivity of molar volumes was plotted against concentration. With the exception of ZnCl2-LiCl the dependance had a similar character for all studied systems. Its form is explained in terms of two opposite processes: the destruction of the associated structure of ZnCl2 molecules upon addition of the alkali metal chloride (the change towards ionic structure is accompanied by decrease in molar volume) and the formation of ZnCl2 complexes upon further addition of chloride which results in increase of molar volume. Anomalous behavior of ZnCl2-LiCl system is apparently due to the small radius of the lithium ion.
APTIC-22101

SOME PROBLEMS INVOLVING PARTICLE-FLUID TWO-PHASE FLOW.

Michigan Univ., Ann Arbor. Thesis (Ph.D.). Ann Arbor, Mich., Univ. Microfilms, Inc., 1968, 120p. 33 refs.
Terry Lee Tranen.
Identifiers: *Aerosols, *Fluid flow, *Dispersions, Particulates, Mathematical analyses, Pressure.

In recent years there has been an increased interest in problems involving particle-fluid two phase flows. Most studies have been conducted with the purpose of a particular application of this subject; these include fluidized beds, rocket exhausts carrying small particles, and air pollution problems. The air pollution problems range from general studies of dusty gas flows, to the design of collectors and the study of dust deposition in the lungs. The flow of carcinogens in atmospheric aerosols is of major importance. A statistical mechanics approach is used to determine continuum mass, momentum, and energy conservation equations for a particle-fluid two phase flow. The equations obtained include the effects of voidage, the fluid phase volume fraction, away from unity. In the energy equation, it is indicated that the entire viscous dissipation occurs in the fluid phase; there are no mechanisms for viscous dissipation in the solid phase. The interactions between the two phases include unsteady and history contributions and steady state Stokes drag. The equations and interaction force used are compared to those suggested by previous authors. Solutions are determined for the oscillating infinite flat plate, and the solution is compared to that for a pure fluid. A solution is determined for a flat plate moved from rest; mass and history contributions are of major importance. In the range of a large Reynolds number, the two phase fluid flow through a normal shock is considered. (Author abstract modified)
APTIC-22109

EFFECT OF SPHERICAL CONDUCTING FOREIGN PARTICLES ON THE ELECTRICAL CONDUCTIVITY OF GASES.

In: High Temperature Properties of Gases. Physical Gas Dynamics, Thermodynamics, and Physics of Combustion. (Svoistva gazov pri vysokikh temperaturakh: fizicheskaya gazodinamika, termodinamika i fizika goreniya). A. S. Predvoditelev (ed.). Moscow, Izdatel'stvo Nauka, 1967. 8 refs. Translated from Russian. A. Barouch, Israel Program for Scientific Translations, Jerusalem, p. 1-13, 1969. CFSTI: N69-35365
E. V. Samuilov.
Identifiers: *Suspended particulates, *Gases, *Electrical resistance, Ussr, Particle size, Mathematical analyses, Diffusion, Ionization, Electrical properties, Electric charge, Temperature.

Conducting particles of small radius can be contained as natural impurities in the products of combustion of a solid or gaseous fuel in high-temperature gas flows interacting destructively with surfaces. Particles are sometimes introduced artificially in the gas to increase its electrical conductivity. The particles affect the conductivity of the gases as a result of thermal ionization (a considerable admixture of electrons is formed in the gas) and the effect of free electrons on the diffusion process. It is assumed that the radius R of the particles is considerably smaller than the average distance between electrons, ions, and charged particles. The conductivity of the gas/particle mixture is obtained by computing the dynamics of the collisions of electrons with the particles, the thermionic emission of electrons from the surface of the particles, by applying the law of mass action and by calculating the electron distribution function by means of the Boltzmann equation.
APTIC-22112

HORIZONTAL RANGE OF OBSERVABILITY IN POLARIZED LIGHT.

Fiz. Atm. i Okeana (Moscow), vol. 4:430-432, Sept. 1969. 4 refs. Translated from Russian. Joint Publications Research Service, Washington, D. C., 3p. (Presented at the All-Union Symposium on Atmospheric Light Scattering, Chernovtsy, USSR, June 1967.) CFSTI: JPRS 48753
G. V. Rozenberg.
Identifiers: *Visibility, *Visible radiation, *Light scattering, Ussr, Photometric methods, Mathematical analyses.

The classical theory of horizontal visibility is easily generalized for the case of photometric observations of a remote source of polarized light against the background of polarized light scattered by the atmosphere or ocean in a horizontal direction. This requires only a generalization of the method proposed by Ye. S. Kuznetsov to a matrix theory of radiation transfer and transformation from visual to photometric content. From the generalization, equations are derived for determining the range of horizontal visibility when observing distant objects through an analyzer and the threshold change in the light flux that can be perceived by a detector with angular dimensions when an object is simultaneously self-luminescent and a screening light from the horizon appears in its field of view. Directions are given for bringing about a considerable change in the range of observability of a distant source of polarized light and distinguishing sources indistinguishable without the use of an analyzer.
APTIC-22114

AIR POLLUTION PROGRAM DESCRIPTION AND OPERATING INSTRUCTIONS INTERNAL MEMORANDUM.

Tracor, Austin, Tex., 47p., Aug. 23, 1968.
Betsy A. Cates.
Identifiers: *Computer programs, Oxides, Thermodynamics.

Computer program AIRPOL is a general program that maintains a data file of chemical compounds and calculates the entropy, the enthalpy, and the logarithm of the equilibrium constant for specified reactions. This program, written in Fortran V, UNIVAC 1108, utilizes a compound data file consisting of metal oxides and related thermodynamic and kinetic data and a bibliography data file which resides on the same magnetic tape. The program will print the bibliography in addition to performing the calculations. Details of the system requirements, operating instructions, and program capabilities are presented. (Author abstract)
APTIC-22115

A STUDY ON THE SOLUBILITY OF GASES. REPORT NO 2.

(Kitai no yokaido ni kansura kenkyu. Dai 2 ho). Text in Japanese. Rikagaku Kenkyusho Iho (Bull. Inst. Phys. Chem. Res., Tokyo), 9 (9): 697-730, Sept. 1930. 17 refs.
T. Horiuchi.
Identifiers: *Solubility, *Gases, Japan, Esters, Chlorinated hydrocarbons, Carbon tetrachloride, Aliphatic hydrocarbons, Acetylenes, Ethylene, Benzenes, Acetone, Temperature.

Experiments to measure the solubilities of gases and to confirm a theoretical equation were performed using ethane, ethylene and acetylene as solutes and carbon tetrachloride, chlorobenzene, benzene, acetone and methyl acetate as solvents. The experimental apparatus was a glass tube expansion manometer which had external diameters of one cm and a length of 20 cm. The temperatures used were 10, 25 and 40 C. The curves of molecular volume (abscissa) versus solubility factor (ordinate) were convex for the solution of SO2 and CCl4, crescendo for SO2 and C6H6 and for SO2 ClC6H5 and concave for SO2 and acetone and for SO2 and methyl acetate. The theoretical values were closer to the experimental values when the solutes and solvents were saturated or non-polarized compounds.
APTIC-22119

A STUDY ON THE SOLUBILITY OF GASES. REPORT NO 3.

(Kitai no yokaido ni kansura kenkyu. Dai 3 ho). Text in Japanese. Rikagaku Kenkyusho Iho (Bull. Phys. Chem. Res., Tokyo), 10 (5): 374-401, May 1931. 11 refs.
T. Horiuchi.
Identifiers: *Solubility, *Gases, Japan, Acids, Inorganic acids, Chlorides, Esters, Ethers, Chlorinated hydrocarbons, Carbon tetrachloride, Chloroform, Benzenes, Acetone, Sulfur compounds, Pressure, Temperature.

The solubility of gases and the volume changes caused by the solution were measured to reconfirm the equation shown in a previous report. The solutes used in this study were methyl ether, methyl chloride, and sulfurous acid. The solvents used were carbon tetrachloride, chlorobenzene, benzene, acetone, methyl acetate, and chloroform. All measurements were performed at 25. The manometer, a hard glass tube with an internal diameter of 1.2 cm, had a sensitivity of 0.1 mm. A curve showing the correlation between the solubility factor and total gas pressure was first obtained. Then the solubilities of the gas under the total gas pressure of zero or 1 atmospheric pressure were calculated from this curve. These experimental results coincided with the results from the theoretical equation shown in the previous report.
APTIC-22120

THE MEASUREMENT OF SOLAR RADIATION, WITH PRINCIPAL EMPHASIS IN THE ULTRAVIOLET COMPONENT.

Intern. J. Air Water Pollution (London), vol. 10:665-688, 1966. 63 refs.
Ralph Stair.
Identifiers: *Radiation measuring systems, *Solar radiation, *Ultraviolet radiation, Instrumentation, Ozone.

The scientific work of the past half-century relating to the measurement of the spectral distribution of radiant energy (in particular in the ultraviolet region) from the sun is reviewed. Mention is made of those special solar disturbances that are expected to result in large variations of the u.v. solar emission as well as the absorbing medium, ozone, which through its turbulence and distribution further affects greatly the spectral distribution of the solar radiation reaching the earth's surface at any locality. Various instrumentations, such as the double monochromator, and the standards employed by different laboratories are discussed in some detail with emphasis placed upon some of their shortcomings and the great lack of accurate solar spectral data, in particular within the u.v. region. New instrumentation, including the filter spectroradiometer, offering promise of considerable usefulness in rapidly obtaining more accurate data in this area is described.
APTIC-22121

7. EFFECTS - HUMAN HEALTH

MONOMOLECULAR FILMS AS A MODEL TO STUDY AIR POLLUTANT-MEMBRANE INTERACTIONS.

Arch. Environ. Health, 18 (4):636-640, April 1969. 18 refs.
N. D. Weiner, M. Amanat, and A. Felmeister.
Identifiers: *Membranes, *Gases, *Surface properties, Lipids, Proteins, Pollutants, Analytical methods, Adsorption, Testing facilities, Exposure chambers, Laboratory facilities, Calibration methods, Hydrocarbons, Olefins, Butenes, Trans-2-butene, Ethylene, Nitrogen oxides, Nitrogen dioxide (no2), Physical states, Permeability.

A study was made of the interaction of typical air pollutant gases with monomolecular films of biologically interesting materials. Synthetic dipalmitoyl lecithin, natural egg lecithin, E coli phospholipids, protein, and phospholipid-protein films were studied. The observed reactions of NO2 with the films suggest that the interaction of NO2 with lipids may result in cell membrane expansion and subsequent changes in cell membrane permeability or enzyme activity.
APTIC-18100

STUDIES OF THE INHIBITION OF BENZPYRENE HYDROXYLATION BY VARIOUS POLYCYCLIC AROMATIC HYDROCARBONS.

(Untersuchungen zur Hemmung der Benzpyren-Hydroxylierung durch verschiedene polycyclische, aromatische Kohlenwasserstoffe.) Text in German. Z. Krebsforsch, 72 (1):57-62, 1969. 22 refs.
H. Kunte.
Identifiers: *Inhibition, *Carcinogens, *Benzo (a)pyrene, Laboratory animals, Mice, Europe, Germany, Phenols, Anthracenes, Fluoranthenes, Pyrenes, Benzopyrenes, Chemical reactions.

In vitro experiments with mouse liver microsomes showed that the hydroxylation of benzo (a)pyrene is inhibited by fluoranthene, pyrene, benzo (a)anthracene, and phenol. With a benzopyrene concentration of 0.000013 M, the inhibition by one of the three hydrocarbons amounts to 20-30% if the concentration is equal. With a five-fold amount there is 30-60% inhibition, and with a 10-fold amount there is 80-93% inhibition. Phenol, in a concentration of 0.003 M, has an effect of only 65% inhibition. The possibility is discussed that noncarcinogenic aromatic hydrocarbons may be able to influence carcinogenesis by environmental factors, since relations in concentration as used in the experiments occur in water, dust, and food. (Author summary modified)
APTIC-18237

INTERACTION OF METAL IONS AND PHOSPHOLIPID MONOLAYER AS A BIOLOGICAL MEMBRANE MODEL.

For primary bibliographic entry see Field 06.
APTIC-18241

FACTORS INFLUENCING THE IN VITRO UPTAKE OF MERCURY VAPOUR IN BLOOD.

Acta. Pharmacol. Toxicol. (Copenhagen), 27 (2-3):161-172, 1969. 24 refs.
F. Nielsen Kudsk.
Identifiers: *Blood cells, *Absorption, *Mercury compounds, Hematology, Blood chemistry, Oxidation, Vapors, Reaction mechanisms.

The influence of a number of factors on the in vitro uptake of mercury vapor in blood was investigated to clarify the mechanism by which mercury is oxidized in the blood. The rate of mercury uptake was moderately increased in a pure oxygen atmosphere, but decreased in a nitrogen atmosphere when compared with the rate of uptake in atmospheric air. Both methylene blue and menadione, in high concentrations, were found to increase the rate of uptake. Hydrogen peroxide generation and an increased oxidation rate of glutathione is a possible explanation for the acceleration of mercury uptake caused by these compounds. The menadione-stimulated uptake could be inhibited by low concentrations of ethyl alcohol. Iodoacetate, in concentrations lower than .00025 M, inhibited the mercury uptake, while concentrations of .0005 M produced an uptake which was 2.5 times that of the normal. The influence of potassium cyanide, sodium nitrate, hydroxylamine, ascorbic acid, sodium fluoride, and glutathione on mercury uptake in blood was investigated. The studies indicate that hydrogen peroxide and oxidized glutathione are important in the oxidation and uptake of mercury vapor. (Author summary modified)
APTIC-18247

PROSTATIC CANCER: RELATIONSHIP TO SUSPENDED PARTICULATE AIR POLLUTION.

Am. J. Public Health, 59 (7):1134-1138, July 1969. 11 refs. (Presented in part at a Joint Session of the Epidemiology, Food and Nutrition, and Mental Health Sections of the American Public Health Assoc. at the Ninety-sixth Annual Meeting, Detroit, Mich., Nov. 13, 1968.)
Warren Winkelstein Jr., and Seymour Kantor.
Identifiers: *Health statistics, *Cancer, *Suspended particulates, Epidemiology, Mortality, Carcinogens, New york state, Nashville, Cadmium compounds, Socio-economic factors.

Observations made in the Nashville Air Pollution Study were compared with those made in the Erie County Air Pollution Study. Air samples were obtained from July 1961 through June 1963 in Buffalo and its immediate environs, and average annual age-specific death rates according to residence at time of death were computed for the period 1959-1961. Suspended particulate pollution levels of the ambient air positively associated with prostatic cancer in white males 50-69 years of age as well as in those 70 years of age and older. For the total 50-69-year group, the mortality rate is almost a third higher in the lower economic group than in the higher; in the older group, the relationship is reversed, with the upper economic group having a mortality rate 1.6 times that of the lower. However, in the 50-69-year age group, differences in mortality rates between the two economic levels for any particular air pollution zone are neither consistent nor large. These observations replicate findings in the Nashville Study. Cadmium oxide dust is known to be present in urban air and seems to be associated with prostatic cancer. If there is an important chemical carcinogen involved in the gensis of prostatic cancer and if its discharge into air increases, it is assumed that human exposure will increase over time.
APTIC-18258

THE CONTENT OF 3,4-BENZOPYRENE IN THE DUST OF COAL BEING TRANSLOADED IN THE PORT.

For primary bibliographic entry see Field 04.
APTIC-19722

ACTUARIAL METHODS IN THE EVALUATION OF DATA FROM LONG-TERM ANIMAL EXPERIMENTS.

National Cancer Inst., Bethesda, Md. and Atomic Energy Commission, Oak Ridge, Tenn., Proc. Conf. Inhalation Carcinogenesis, Gatlinburg, Tenn., 1969, p. 455-457. 5 refs. (Oct. 8-11.)
Francis J. C. Roe.
Identifiers: *Experimental methods, *Statistical analyses, Laboratory animals, Mice, Life span, Mortality, Diagnosis, Autopsy, Carcinogens, Great britain, Data analysis.

To insure the statistical validity of data from long-term animal experiments, special analytical methods should be considered. Proper randomization of animals is a prerequisite for a quantitative experiment in which statistical evaluation is contemplated. Particularly important in the case of life-span studies is the daily observation of experimental animals. Postmortem autolysis occurs rapidly in mice, and, in all species, detailed histopathological evaluation is rendered increasingly difficult as the interval between death and necropsy increases. Commonly used ways of expressing data from carcinogenicity experiments are illustrated. Curves illustrating a continuous adjustment for non-relevant deaths, and tumor-free survivors are included. The concept of expressing results in terms of percent of animals should be abandoned in favor of the concept of 'time-standardized risk.'
APTIC-19765

EFFECT OF BENZO (A)PYRENE ON HAMSTER, RAT, DOG, AND MONKEY RESPIRATORY EPITHELIA IN ORGAN CULTURE.

National Cancer Inst., Bethesda, Md. and Atomic Energy Commission, Oak Ridge, Tenn., Proc. Conf. Inhalation Carcinogenesis, Gatlinburg, Tenn., 1969, p. 433-44 (Oct. 8-11.)
T. Timothy Crocker.
Identifiers: *Tissue cultures, *Respiratory system, *Benzopyrenes, Dogs, Hamsters, Primates, Rats, Bronchi, Trachea, Epithelium, Inhibition, Bronchial cancer, Lung cancer, Tracheal cancer, Carcinogens.

The results of experiments conducted on the effects of benzo (a)pyrene on animal respiratory tracts are discussed. Tracheas and bronchial tubes from dogs, rats, hamsters, and monkeys were treated in a medium to determine the cellular responses. Morphologic alterations toward abnormally differentiated epithelial states were produced in culture, and there is reason to believe

that living tissue would respond similarly. The organ culture system is useful in testing metabolic interactions between tissues and carcinogens and to explore inhibitors of the effects of potential carcinogens that man cannot avoid inhaling. The effect of Vitamin A upon lesions produced by benzopyrene is demonstrated.
APTIC-19779

BIOCHEMICAL PARAMETERS IN INHALATION CARCINOGENESIS.

National Cancer Inst., Bethesda, Md. and Atomic
Energy Commission, Oak Ridge, Tenn., Proc.
Conf. Inhalation Carcinogenesis, Gatlinburg,
Tenn., 1969, p. 209-228. 97 refs. (Oct. 8-11.)
George C. Buell.
Identifiers: *Breathing, *Carcinogens, Rabbits, Humans, Cells, Lipids, Membranes, Nucleic acids, Proteins, Lungs, Cancer, Hydrocarbons, Nitrogen dioxide (no2), Peroxides, Ozone, Free radicals.

Two insoluble lung proteins, collagen and elastin, are altered (denatured) following exposure to either ozone or nitrogen dioxide. Electron micrographs of collagen fibers isolated from the lungs of exposed rabbits appear to confirm this. It may be significant that denaturation has been ascribed a role in carcinogenesis. Evidence of lipid peroxidation in vivo after exposure to either ozone or NO2, and the possible consequences of peroxidation in cells and cellular membranes are discussed. Since the presence of peroxides implies the presence of free radicals, some of the evidence linking the latter cancer is summarized. Spectral characteristics of DNA isolated from rabbit lung and the interaction of DNA with polycyclic hydrocarbons is discussed, as is a possible role for air pollutants in carcinogenesis. Known biochemical parameters of nonhydrocarbon, air borne carcinogens are reviewed, and potentially productive areas of research are outlined. (Author abstract)
APTIC-19780

FOREWORD. SOME DATA ON THE DISTRIBUTION OF OCCUPATIONAL MANGANESE INTOXICATION. HYGIENIC SIGNIFICANCE OF MANGANESE OXIDES IN CERTAIN INDUSTRIAL PROCESSES. CONCLUSION.

In: Manganese Oxides (Their Comparative
Toxicity, Hygienic Significance and Clinical
Picture of the Chronic Effect of Manganese).
(Okisly margantsa (sravnitel'nava ikh
toksichnost'. Gigiyenicheskove znachenive i
klinika khronicheskogo vozdsystviva margantsa)).
N. V. Lazarev and E. N. Levina (eds.), Leningrad,
1962, Foreword, Chapt 2, Chapt 9, Conclusion, p.
3-6, 14-18, 108-130, 153-163. Translated from
Russian. Joint Publications Research Service,
Washington, D. C., 36p., April 15, 1963.
E. N. Levina, and M. M. Tuchenko.
Identifiers: *Occupational health, *Toxicity, *Primary metallurgical processing, *Manganese compounds, Chronic, Laboratory animals, Pathological techniques, Glands, Manganese, Ussr, Mining, Oxides.

Among the toxic metals, manganese has acquired particular importance due to the rapid growth of the metallurgical industry. The increasing hazard of occupational manganese intoxication indicates the need for establishing clinical diagnosis and demonstrating the earliest signs of intoxication. A study was made of working conditions in the new types of industries which produce manganese, and in the underground mining of manganese ores of different origins. Of principal significance was the determination of manganese concentrations in the form of oxides containing the bi-, tri-, and tetravalent metal. Clinical examination of workers of different industries made it possible to demonstrate the existence of the toxic effect of manganese in various groups. The possibility arose for proposing a classification of this chronic intoxication, demonstrating its earliest manifestations, and making the most efficient suggestions for work arrangements. A comparative experimental study was made on the effects of four oxides containing manganese in the bi-, tri-, and tetravalent forms after brief and prolonged effects of the animal organisms. The aim of the study was to solve the problem of different degrees of toxicity of the oxides. An investigation was made of pathological and histopathological changes in some internal organs and glands of secretion after intoxication with different manganese oxides.
APTIC-19789

STUDIES IN PULMONARY CARCINOGENESIS.

National Cancer Inst., Bethesda, Md. and Atomic
Energy Commission, Oak Ridge, Tenn., Proc.
Conf. Inhalation Carcinogenesis, Gatlinburg,
Tenn., 1969, p. 321-351. 26 refs. (Oct. 8-11.)
Sidney Laskin, Marvin Kuschner, and Robert T.
Drew.
Identifiers: *Lung cancer, Rats, Humans, Epidemiology, Cells, Bronchi, Breathing, Carcinogens, Exposure methods, Hydrocarbons, Benzopyrenes, Chromium compounds, Sulfur dioxide, Photoionization, Light radiation.

Epidemiological and experimental evidence has increasingly indicated that the interplay of multiple environmental factors is responsible for the induction of lung cancer. Man is exposed to a complex mixture of potentially hazardous materials, including specific carcinogens and a variety of agents which may modify the manner in which the lung handles inhaled materials or responds to them. A program to isolate and identify these environmental factors and to evaluate their effects is described. Bronchogenic carcinoma, histologically similar to that seen in man, has been successfully produced in high incidences. The techniques involve inhalation exposures with rats, surgically implanted intrabronchial pellets in rats and hamsters, surgically implanted threads in rats and mice, and intratracheal intubations in hamsters. Dose-response relationships for the induction of squamous cell carcinomas have been developed from the intrabronchial pellet technique with both polcyclic hydrocarbons and ionizing radiation. Compounds of chromium are capable of producing bronchogenic carcinoma of the lungs in experimental animals. Of special interest is the production of both squamous cell carcinoma and adenocarcinomas correlating with human findings. Inhalation of benzo (a)pyrene in combination with exposure to sulfur dioxide has resulted in the production of squamous cell carcinomas. These findings are of particular significance since both materials have been implicated in community air pollution problems and since these represent the first duplication of human lung cancer in animals by inhalation exposures to polycyclic hydrocarbons. (Author abstract modified)
APTIC-19835

PROGRAM PLANNING IN INHALATION CARCINOGENESIS: NATIONAL CANCER INSTITUTE PLANS.

National Cancer Inst., Bethesda, Md. and Atomic
Energy Commission, Oak Ridge, Tenn., Proc.
Conf. Inhalation Carcinogenesis, Gatlinburg,
Tenn., 1969, p. 467-481. 22 refs. (Oct. 8-11.)
Umberto Saffiotti, and Carl G. Baker.
Identifiers: *Plans and programs, *Research institutes, *Lung cancer, Research programs, Humans, Tobacco, Bio-assay, Respiratory system, Epithelium, Cell metabolism, Inhibition, Breathing, Smoking, Carcinogens, Particulates, Smokes, Vehicles.

A Special Lung Cancer Program was established by the National Cancer Institute during fiscal year 1969. Existing collaborative projects in this field are being further developed and coordinated with the new efforts. A new Lung Cancer Unit is being established in the intramural laboratories of the Carcinogenesis Area. Particular emphasis is being given to the problem of tobacco smoke and the development of a less hazardous cigarette. A plan has been developed and is articulated in the following phases: selection, preparation, and characterization of different types of tobacco and tobacco smoke condensates for subsequent bioassay and analysis; bioassay of tobacco smoke and its fractions in a battery of animal systems; chemical analysis of tobacco smoke and its fractions; evaluation of the data obtained in relation to the human situation. Considerable effort is being given to further development, characterization, and definition of biological models appropriate for the bioassay of respiratory carcinogens and for the study of key factors involved in their carcinogenic activity. In view of the key role of particulate materials in respiratory tract carcinogenesis, a group of collaborative projects will provide data to characterize, define, and standardize the conditions of exposure to respiratory carcinogens in the presence of vehicles and particles with different physico-chemical properties. The kinetics of the cellular response to such exposures will also be determined. The relation between squamous differentiation and neoplastic response in the respiratory epithelium and their concurrent inhibition by vitamin A will be further characterized and defined. (Author abstract modified)
APTIC-19836

CHAMBER DEVELOPMENT AND AEROSOL DISPERSION.

National Cancer Inst., Bethesda, Md. and Atomic
Energy Commission, Oak Ridge, Tenn., Proc.
Conf. Inhalation Carcinogenesis, Gatlinburg,
Tenn., 1969, p. 173-191. 45 refs. (Oct. 8-11.)
Dietrich Hoffmann, and Ernest L. Wynder.
Identifiers: *Aerosols, *Exposure chambers, *Dispersion, Laboratory animals, Tobacco, Bioassay, Respiratory system, Breathing, Smoking, Toxicity, Carcinogens, Engine exhausts, Smokes, Controlled atmospheres, Particle growth, Density.

Most bioassays with suspected carcinogenic inhalants are carried out by passive inhalation. In these studies small mammals are exposed, in inhalation chambers, to fresh tobacco smoke, urban air, diluted automobile exhaust, synthetic air pollutants, occupational respiratory environments, or pure chemicals. Although each test requires a specific design, several uniform problems tend to occur during passive inhalation. These include particulate aggregation, physical and chemical aging, formation of concentration zones, and increased toxicity with time-delayed exposure to short-term inhalants. Since it represents the chemically most complex and densest man-made respiratory environment, tobacco smoke is particularly affected by these problems. Progress with inhalation chambers used in studying cigarette smoke are reviewed. For anatomic and physiologic reasons, it is doubtful whether enough tobacco smoke can enter the lower respiratory tract to elicit a neoplastic change, although the upper air passages may receive sufficient smoke exposure for such a response. (Author abstract)
APTIC-19838

EFFECTS OF CHRONIC EXPOSURE TO ARTIFICIAL SMOG AND CHROMIUM OXIDE DUST ON THE INCIDENCE OF LUNG TUMORS IN MICE.

National Cancer Inst., Bethesda, Md. and Atomic
Energy Commission, Oak Ridge, Tenn., Proc.
Conf. Inhalation Carcinogenesis, Gatlinburg,
Tenn., 1969, p. 305-320. 17 refs. (Oct. 8-11.)
P. Nettesheim, M. G. Hanna Jr., D. G. Doherty, R.
F. Newell, and A. Hellman.
Identifiers: *Lung cancer, *Tumors, *Smog, *Chromium oxides, Chronic, Mice, Morbidity, Radiological health, Lungs, Breathing, Viruses, Dusts, Gasolines, Ozone, X-rays.

Specific-pathogen-free C57BL/6 mice, pretreated with 100 R of whole-body X-radiation and/or infected with PR8 influenza virus, were placed in inhalation chambers and exposed to either ozonized gasoline or an insoluble chromium oxide dust. The main findings were as follows: male mice had a significantly higher incidence of lung tumors than females; irradiation raised the incidence of lung tu-

mors in females but not in males; chronic exposure to ozonized gasoline increased the lung tumor incidence in both sexes; infection with PR8 influenza virus appeared to retard lung tumor growth; exposure to chromium oxide dust had no discernible effect on lung tumor incidence. The only lung tumors observed during the course of these experiments were adenomas and adenocarcinomas. Under the experimental conditions used, the combination of treatments had no additive or potentiating effects. (Author abstract)
APTIC-19839

EXPERIMENTAL RESPIRATORY TRACT CARCINOGENESIS AND ITS RELATION TO INHALATION EXPOSURES.

National Cancer Inst., Bethesda, Md. and Atomic Energy Commission, Oak Ridge, Tenn., Proc. Conf. Inhalation Carcinogenesis, Gatlinburg, Tenn., 1969, p. 27-54. 38 refs. (Oct. 8-11.)
Umberto Saffiotti.
Identifiers: *Respiratory system, *Breathing, *Carcinogens, *Exposure methods, Laboratory animals, Humans, Bio-assay, Epithelium, Pulmonary function, Lung cancer, Tumors, Asbestos, Beryllium compounds, Nickel compounds, Nitroso.

Inhalation exposures in experimental respiratory carcinogenesis studies can be directed toward two major objectives: (1) definition of penetration, distribution, retention, and fate of inhaled materials, and of related host responses; and (2) induction of tumors (particularly respiratory tract tumors) in experimental animals, including evaluation of inhalation bioassays for carcinogenic effects. Critical selection of experimental conditions must include consideration of both adequate inhalation system technology to ensure control of experimental conditions and effective exposure of biological targets (sufficient dosage at pulmonary level) and adequate sensitivity of biological models to ensure measurable and meaningful end points (biometrically acceptable level of susceptibility to tumor induction). For studies aimed at relating experimental exposures to the identification and control of causative factors for lung cancer in man, it is important to select specifically susceptible animal models in which induction of carcinomas from the respiratory epithelium can be experimentally reproduced. Such animal models have been developed, using physical and chemical agents applied directly into the respiratory tract by various techniques (pellet implantation, intratracheal instillations). Inhalation exposures have been repeatedly successful with radionuclides, but so far only a few instances of respiratory carcinogenesis by inhaled chemicals have been experimentally well documented (nickel carbonyl, beryllium, asbestos, and certain N-nitroso compounds). Systemically acting carcinogens that selectively affect the respiratory epithelium have been identified and in some cases shown to interact with topical exposures with remarkable potentiation of carcinogenic effects. Definition of host response conditions and multiple, interacting pathogenetic factors can be used to develop animal models capable of highly sensitive, selective carcinogenic responses to respiratory exposures even at relatively low dose levels, such as can be provided by inhalation techniques. (Author abstract)
APTIC-19840

MODELS FOR THE STUDY OF PARTICLE RETENTION AND ELIMINATION IN THE LUNG.

National Cancer Inst., Bethesda, Md. and Atomic Energy Commission, Oak Ridge, Tenn., Proc. Conf. Inhalation Carcinogenesis, Gatlinburg, Tenn., 1969, p. 103-119. 32 refs. (Oct. 8-11.)
P. E. Morrow.
Identifiers: *Lungs, *Retention, *Particulates, * mathematical modeling, Humans, Bronchi, Trachea, Breathing, Deposition, Lung clearance, Aerosols, Mathematical modeling, Simulation, Radioactive radiation.

The direct or inferred relationship between appropriate measurements of aerosols or gases and inhalation risk has been the basis for most of environmental hygiene and health physics practice in the assessment of airborne hazards. A modern extension of this concept is the design and application of lung models for the purpose of developing more realistic evaluation procedures, which, moreover, can utilize variations in environmental conditions to affect changes in risk estimations. Examples are the several tracheobronchial models expressly designed for radon daughter dosimetry and the Lung Dynamics Task Group of the International Committee on Radioactive Protection (ICRP) model proposed for radioactive aerosols generally. Particulate deposition information is reviewed as an introduction to the main topic, the elimination of nongaseous materials from the respiratory system. The models discussed are (a) the amended ICRP Committee 2 lung model, (b) a new kinetic description for tracheobronchial clearance, and (c) a new conceptual basis for generalizing particulate elimination from the lung parenchyma. The mechanisms and pathways underlying these models provide cogent information for understanding lung responses to environmental contaminants even when simple dose-effect relationships are not available or applicable. (Author abstract modified)
APTIC-19841

A STUDY OF HEALTH CONDITIONS OF THE POPULATION LIVING IN THE VICINITY OF AN ALUMINUM FACTORY.

(Studio sulle condizioni di salute della popolazione abitante nelle vicinanze di una fabbrica di alluminio). Med. Lavoro (Milan), 59 (5):376-380, 1968. 4 refs. Translated from Italian. Belov and Associates, Denver, Colo., 6p., Jan. 27, 1970.
G. Balazova, and A. Rippel.
Identifiers: *Children, *Absorption, *Fluorine, Hematology, Urinalysis, Blood cells, Digestive system, Respiratory system, Skin, Retention, Aluminum, Czechoslovakia, Non-urban areas, Industrial areas, Primary metallurgical processing.

The health conditions of children living near an aluminum factory were studied. The ambient pollution from fluorine emitted by the factory was very high. High fluorine values were found in the agricultural products of the areas near the factory. In the children examined, the absorption of fluorine by the digestive and respiratory systems was approximately 2.15 mg/day. The children showed a marked increase in the fluorine content in their teeth, hair, nails, and urine when compared with children living in a non-polluted area. Clinical and laboratory studies revealed a moderate decrease in hemoglobin values and an increase in the red blood cell count in children exposed to a high absorption of fluorine. When some of the children were transferred to a non-polluted zone, the urinary excretion of fluorine decreased by 40% after one month. It may, therefore, be assumed that the accumulation of fluorine is reversible. (Author summary modified)
APTIC-19880

STABLE LEAD AND RADIOLEAD (210PB) IN THE 'ARCTIC' FOOD CHAIN.

For primary bibliographic entry see Field 08.
APTIC-19881

AIR POLLUTION AND BLOOD GAS.

(Taiki osen to ketsueki gasu). Text in Japanese. Naika, 21 (5):836-840, May 1968.
T. Umezawa.
Identifiers: *Toxicity, *Hematology, *Carbon monoxide, *Sulfur dioxide, Respiratory system, Blood gas analysis, Carboxyhemoglobin, Respiratory system, Eye irritation, Japan, Cyanides, Nitrogen dioxide (no2), Carbon disulfide, Hydrogen sulfide.

Chemical substances as air pollutants are carbon fly ash, sulfur dioxide, sulfur trioxide, hydrogen sulfide, nitric oxide, nitrogen dioxide, ammonia, ozone, carbon monoxide, carbon dioxide, hydrogen fluoride, hydrogen chloride, aldehydes, carbon hydrates, tar, radioactive gases, aerosols, etc. Gas poisoning cases reported in Japan during a 2-year period between 1956 and 1957 were as follows: CO, 126; NO2, 45; SO2, 45; H2S, 12; CN, 11; and CS2, 7. SO2 and CO are the most important air pollutants observed within the exhaust gas of factories and automobiles, respectively. CO enters the human body only through respiratory organs, and SO2 through both respiratory and digestive organs. Discomfort occurs when the CO concentration is 1000 to 1200 ppm (after 1 hour's inspiration) or when CO toxicity ratio (ppm x hour) is more than 600. Mortality may occur when CO concentration is 1500 to 2000 ppm (after 1 hour's inspiration) or when CO toxicity ratio is more than 1500, or when carboxyhemoglobin concentration is 60 to 80%. CO concentration in the ambient air is not always parallel to COHb concentration in the blood, and the latter is influenced by age, sex, condition of health, smoking, or residence. Symptoms of CO toxicity were shown. Harmful effects of SO2 on human bodies are irritation, especially to mucosal membranes, (eyes, respiratory tract, esophagus, stomach, etc.), and acidosis due to the decrease of alkaline reserve within the blood due to H2SO3, causing disturbances of bone growth in children or myocardial degeneration in adults.
APTIC-19939

ON THE INFLUENCE OF EXHAUST OF AUTOMOBILE ON HUMAN BODY.

For primary bibliographic entry see Field 01.
APTIC-19940

BCG-INOCULATION AND BITUMINOUS COAL PNEUMOCONIOSIS.

Intern. Arch. Gewerbepathol. Gewerbehyg. (Heidelberg), vol. 23:347-357, 1967. 11 refs. Translated from German. National Institutes of Health, Bethesda, Md., Translating Unit, 13p., July 17, 1969.
Bedrich Mautner.
Identifiers: *B. calmette-guerin (bcg), *Antigens, *Pneumoconiosis, *Mining, Morbidity, Occupational health, Silicosis, Tuberculosis, Czechoslovakia, Germany, Bacteria, Dusts, Coal.

Two groups of miners from the Ostrava-Karwin bituminous coal area in Czechoslovakia were observed to determine the danger of developing pneumoconiosis. Variations in dust exposure, according to different mines and types of underground work, were noted. To avoid this source of error in estimating the danger from dust exposure in the two groups, a dust exposure coefficient was introduced, based on the health conditions of each mine and each work area. Tuberculosis was found in 2.7% of those inoculated with B. Calmette-Guerin (BCG) in comparison with 4.6% in the non-inoculated group. This confirms the fact that BCG inoculation provides protection from tuberculosis in bituminous coal miners. In comparison with 15.5% of inoculated persons, 35.9% of non-inoculated persons developed bituminous coal pneumoconiosis. A similar result was found when comparing the frequency of pneumoconiosis in relation to the duration and degree of dust exposure. Among coal diggers, in those inoculated with BCG, pneumoconiosis was found in 31.3% of the cases; among the non-inoculated, the figure was 58.5%. When the BCG-inoculated group was subdivided according to time of inoculation, the pneumoconiosis frequency among those inoculated during dust exposure was 20.5%; in those inoculated before starting underground work, the figure was 12.1%. (Author summary modified)
APTIC-19947

EFFECTS OF MASKING NOISE ON THE SISI TEST.

J. Auditory Res., vol. 8:331-337, 1968. 7 refs.

I. M. Young, and C. H. Wenner.
Identifiers: *Hearing, *Sisi test, Thresholds, Diagnosis.

The SISI test is a commonly employed clinical procedure based on response to minimal intensity changes. The effects of masking and the signal/noise ratio on the SISI score are investigated. The test is performed on five trained normal hearing subjects in the presence of ipsilateral masking noise. When the signal/noise ratio is +5 db or greater for white noise, and +15 db or greater for narrow band noise, all subjects show similar high SISI scores for the various frequencies and testing levels. The larger the increment size in the modified SISI test, the less the signal/noise ratio necessary to obtain high scores.
APTIC-19961

CLINICAL APPLICATION OF BEKESY AUDIOMETRY.

Laryngoscope, 78 (4):487-497, April 1968. 14 refs.
(Presented at the Meeting of the American
Laryngological, Rhinological, and Otological
Society, Inc., Eastern Section, Pittsburgh, Pa.,
Jan. 3, 1968.)
Fred Harbert, and I. M. Young.
Identifiers: *Bekesy audiometry, *Hearing, Thresholds, Diagnosis.

The clinical applications of Bekesy audiometry are discussed. The method of operation of the procedure is described. The output of an oscillator is passed through an attenuator operated by the subject who can reverse the direction of intensity change. The signal to the patient can be varied or continuous in terms of frequency, tone, and time. Procedures for analyzing the tracings are given, and threshold levels are discussed. The method is useful in masking studies, in temporary threshold shift studies, and in investigating functional deafness. The Bekesy audiometer displays versatility, permanent recordings, and ease of determining both qualitative and quantitative psychoacoustic response patterns.
APTIC-19962

EFFECTS OF IPSILATERAL MASKING ON BEKESY AMPLITUDE.

J. Auditory Res., vol. 8:357-365, 1968. 13 refs.
I. M. Young.
Identifiers: *Bekesy amplitude, *Hearing, Thresholds, Diagnosis.

Studies on contralateral ear masking indicate that changes may occur in the threshold and amplitude width of Bekesy tracings from normal and pathological ears when a masking signal is presented at levels too low for there to be a cross masking effect. The effects of ipsilateral masking upon the amplitude width of discrete and sweep-frequency-pulsed-and continuous -tone Bekesy tracings are investigated. Bekesy amplitude width for both pulsed and continuous signals is studied in quiet and in the presence of ipsilateral masking stimuli for three normal listeners and for 48 patients with pure sensorineural hearing loss. White noise and pure tones are alternately used as masking stimulus. No evidence of any consistent relationship between amplitude and masking noise level is seen.
APTIC-19964

EFFECTS OF YOKKAICHI AIR POLLUTION ON THE LIVING BODY-PATHOLOGICAL STUDY OF ASTHMA AND RABBITS.

(Yokkaichi taikiosen no seitai eno eiko -
zensokurei to iεusagi no byorigakuteki kento).
Text in Japanese. Igaku No Ayumi (Progr. Med.).
7 (8):360-363, Nov. 22, 1969. 3 refs. Mie
Prefectural Univ. School of Medicine (Japan).
H. Yamagiwa, J. Nakamura, Y. Hamazaki, S.
Takeda, and Y. Sakakura.
Identifiers: *Pathological techniques, *Asthma, Rabbits, Humans, Japan, Urban areas, Sulfuric acid, Sulfur dioxide, Sulfur trioxide.

Repeated asthmatic paroxysms were induced in rabbits, after which extensive examinations were conducted of lungs and other organs. Glissonitis was accompanied by equall amounts of minor and medium lymphocytes and the infiltration of plasma cells. Adrenal glands were remakably reduced, and cortical substances exhibited a yellowish brown pigment. The air in Yokkaichi city was composed of sulfur dioxide, sulfur trioxide, sulfuric acid mist, and nitrogen compounds. As for their effects on the respiratory system, the human upper airpassage and pharynx were affected by the frequent and direct action of the materials. The presence of chronic bronchial catarrh was observed, as was the presence of asthmatic bronchial catarrh which appears to be caused by an allergy mechanism. Some patients with chronic asthmatic spasms died from the bronchial catarrh. It is concluded that bronchial asthma is implicated when the asthmatic paroxysm occurs in a polluted area like Yokkaichi city.
APTIC-20255

ATOMIC ABSORPTION SPECTROPHOTOMETRIC DETERMINATION OF REGIONAL-TYPE PLUMBEMIAS.

(Determinacion por espectrofotometria de
absorcion atomica de una plumbemia de tipo
regional). Text in Spanish. Anales Real Acad.
Farm. (Madrid), 35 (4):421-435, 1969. 27 refs.
M. Jerardino, and C. Barrios.
Identifiers: *Blood chemistry, *Non-urban areas, *Urban areas, *Lead compounds, Adults, Age, Urinalysis, Industrial areas, Spectrophotometry.

Blood and urine samples were taken from 100 normal human subjects (50 urban, 50 rural) and from 40 subjects from environments in which they were known to be exposed to quantities of lead; samples were examined for lead content, using a Perkin-Elmer atomic absorption spectrophotometer. From the data, a standard 'urban' value and a standard 'rural' value for the lead content of the blood was established. No significant difference was found between urban and rural values in the case of the lead content of urine, and serum proteins did not differ significantly except in the case of the gamma globulins. Employees of Acero del Pacifico, of gasoline companies, and of a printing plant gave blood samples with a significantly higher lead content. The lead content of blood in normal individuals was dependent on age.
APTIC-20287

SUBCELLULAR TRACE METAL ALTERATIONS IN RATS EXPOSED TO 50 PPM OF CARBON MONOXIDE.

Am Ind. Hyg. Assoc. J., 31 (2):183-188, March-
April 1970. 11 refs.
Stanley D. Mazaleski, Ronald L. Coleman, Robert
C. Duncan, and Carl A. Nau.
Identifiers: *Liver, *Toxicity, *Trace analysis, *Carbon monoxide, Rats, Respiration, Proteins, Cell metabolism, Cobalt compounds, Copper compounds, Iron compounds, Magnesium compounds, Zinc compounds, Chronic.

Significant trace metal alterations and migrations in rat liver fractions indicate that chronic exposure to 50 ppm carbon monoixde, the currently accepted 'no effect' Threshold Limit Value, exerts a prolonged effect at the subcellular level. Rats were chronically exposed to this level for 5 hours a day, 5 days a week. The concentrations of zinc, cobalt, copper, iron, and magnesium were determined in liver nuclear, mitochondrial, and supernatant fractions by atomic absorption spectroscopy. The five metal species changed significantly at various periods during the study, but cobalt appeared to show the most massive and consistent loss from all rat liver fractions. There was an increased mobilization of magnesium throughout the 12 week investigation. A consistent trace metal loss of the five species observed in the mitochondrial fraction indicates an overall reduction of cellular respiration and ATP production. The results suggest that chronic CO exposure does exert an effect on trace metals at the subcellular level with a possible reduction in cellular respiration and nucleoprotein synthesis. Because these alterations were shown during the 'no effect' Threshold Limit Value CO exposure level, it is suggested that further investigation be directed toward this level. (Author summary modified)
APTIC-20685

VASCULAR SEQUELAE TO CADMIUM FUME EXPOSURE.

Am. Ind. Hyg. Assoc. J., 31 (2):180-182, March-
April 1970. 13 refs.
Mitchell R. Zavon, and C. Douglas Meadows.
Identifiers: *Metal poisoning, *Fumes, *Cadmium compounds, Toxic tolerances, Cardiovascular diseases, Nausea, Respiratory diseases, Bronchopneumonia, Pneumonia, Pulmonary edema.

The effects of cadmium fume exposure in two men are discussed. One of the men died two weeks after admission to a hospital. Autopsy revealed coronary arteriosclerosis with organizing thrombosis of the circumflex branch of the left coronary artery. There was massive infraction and cor pulmonale. The lungs showed emphysematous changes with interstitial fibrosis, bronchiectosis with endogenous lipid pneumonia, and acute bronchopneumonia. The second man was treated by his family physician for pneumonia, and made a slow recovery over the next three months. He continued to complain of loss of appetite, exertional dyspena, and increased thirst. The cadmium concentration in the air, shown by a repetition of the original episode, indicated and exposure well above the threshold limit value of 0.1 mg/m.
APTIC-20686

THE PULMONARY RESPONSE TO FIBROUS DUSTS OF DIVERSE COMPOSITIONS.

Am. Ind. Hyg. Assoc. J., 31 (2):125-132, March-
April 1970. 8 refs.
Paul Gross, Robert T. P. DeTreville, Lewis J.
Cralley, William T. Granquist, and Fred L.
Pundsack.
Identifiers: *Respiratory system, *Dusts, Rats, Pathological techniques, Bronchi, Alveoli, Trachea, Ceramics, Glass, Asbestos, Quartz, Aluminum silicates.

Fibrous quartz, chrysotile asbestos, and tremolite talc dust of respirable particle size, injected intratracheally into rats, produced polypoid proliferative inflammations within smaller air-conducting tubes, and also in more peripheral areas. With time, the inflammatory tissue became converted into collagenous scars which often caused permanent deformaties of bronchi and bronchioles. Synthetic chrysotile, ceramic aluminum silicate, silicon carbide, glass, and brucite were also introtracheally injected. The main pulmonary response was a marcrophage reaction with minimal stromal participation. Within four days after the injection, foci of polypoid proliferative inflammation were seen, limited to the peripheral respiratory bronchiole and alveolar ducts. Because these polypoid lesions did not collagenize and did not destroy the anatomic integrity of the air spaces, and because they were reversible, the dusts causing this type of response are classed as biologically 'inert'. These lesions are believed to be artifactual in the sense that their production is determined by the method of introducing the dust into lungs, since such lesions are not seen in animals inhaling high concentrations of the same dusts. (Author abstract modified)
APTIC-20688

MEDICAL RESEARCH ON AIR POLLUTION: DIAGNOSIS OF CHRONIC RESPIRATORY DISEASES BY GROUP EXAMINATION BASED ON QUESTIONNAIRES.

(Taikiosen ni kansuru igakukenkyu:
shitsumonhyo o chushin to shita shudankenshin ni
yoru manseikokyukishojo no tekishutsuho). Text
in Japanese. Chiba Igakkai Zasshi (J. Chiba Med.
Soc.). 44 (5):746-758. Jan. 28. 1969. 23 refs.

Akio Saito.
Identifiers: *Diagnosis, *Respiratory diseases, *Questionnaires, Males, Respiratory functions, Japan, Industrial areas, Suspended particulates, Solvents, Statistical analyses.

Questionnaires developed by the British Medical Research Council (BMRC) were evaluated. The main point was whether the questionnaires retrieving informations such as coughing, phlegm, and shortness of breath, together with simple vital capacity tests and chest X-rays, can discover some definite effects of air pollution on groups of people before many of them are clinically diagnosed as being afflicted by respiratory ailments. In addition, actual statistical correlations between the affliction rate and the degree of pollution were sought by examining groups of people exposed to varying degrees of air pollution differing in characteristics and concentration. The study essentially followed the work by Whitney; 643 male workers in four different occupational environments (suspended particles and organic solvent odors and two controls) from three factories in the Tokyo-Chiba Industrial Complex were chosen as subjects. The result of the investigation indicated the primary significance of the BMRC questionnaires in grasping the affliction rate for subjective symptoms; vital capacity tests and chest X-rays were secondary in significance. In the case of long-term air pollution, clinical examinations are necessary in order to investigate whether respiratory illnesses have increased, but even then the BMRC method is effective as the primary screening mechanism.
APTIC-22021

THE OCCURRENCE OF THE MISUSE OF ANALGETICS.

(Die Entstehung des Schmerzmittelmissbrauchs). Text in German. Z. Praeventivmed., vol. 13:318-336, 1968. 22 refs.
W. Blumer.
Identifiers: *Drugs, *Health impairment, *Automotive emissions, Humans, Headache, Europe, Industrial areas, Chemical processing, Glue manufacturing, Metal fabricating and finishing, Paper manufacturing, Primary metallurgical processing, Textile manufacturing, Automobiles.

In an industrial village (13 factories) with 3000 inhabitants, 108 analgetic-dependent persons (90 women and 18 men) were observed during the period of ten years. Four of them died of renal insufficiency. Because there were also many slight cases, it was possible to study the conditons for the origin of misuse. Psychosomatic influences were not important at the beginning of the misuse. In most cases the misuse began in areas where the people were exposed to traffic for a long time. In a quarter free of traffic, the start of misuse was seldom observed. Persons who could get away from the traffic could be cured, and those with professional exposure to exhaust gases suffered frequently from headaches. Through adequate treatment of the patients suffering from headaches, no new cases of tablet misuse were found.
APTIC-22033

AIR POLLUTION AND HEALTH.

(Pollution atmospherique et sante). Text in French. Pollut. Atmos. (Paris), vol. 12:57-65, May 1970.
Andre Roussel.
Identifiers: *Epidemiology, Air pollution episodes, Legislation, Diseases and disorders, Allergies, Anemia, Bronchial cancer, Lung cancer, Eye irritation, Asthma, Meuse valley, France, London, Donora.

Various panel members discuss air pollution legislation, definitions of air pollution, types of pollution, methods of study (experimental, epidemiological), historical occurrences of pollution incidents, specific illnesses attributed to pollution (anemia, asthma, irritation of the eyes, broncho pulmonary cancer), and potentiating effect of pollution on bacterial infections.
APTIC-22050

AIR POLLUTION AND ASTHMATIC ATTACKS IN THE LOS ANGELES AREA.

Public Health Rept. (U. S.), 76 (6):545-548, June 1961. (Presented at the Air Pollution Research Planning Seminar, 2nd Annual, Cincinnati, Ohio, Feb. 4, 1959.)
Charles E. Schoettlin, and Emanuel Landau.
Identifiers: *Asthma, *Los angeles, *Smog, Humans, Plant damage, Eye irritation, Oxidants, Particulates, Humidity, Temperature (atmospheric), Carbon monoxide.

During the autumn months of 1956, a study was undertaken in Pasadena, California, to ascertain the effects of smog on persons having bronchial asthma. For 98 days, 137 asthma patients maintained a daily record of each of their respiratory attacks. Measurements were taken concurrently of total atmospheric oxidants, particulates, and carbon monoxide, plus relative humidity and temperature, and plant damage. The peak period for attacks was indicated to be from midnight to 6 am, but the maximum oxidant levels were recorded between 10 am and 4 pm. Asthmatic attacks occurred with equal frequency among males and females. Low positive correlations were found between chemical measures of air pollution and number of persons having attacks. Low correlations were also noted for temperature, relative humidity, and water vapor pressure. A significantly greater number of persons had attacks on days with high enough oxidant values to cause eye irritation (25 pphm) than on other days. The number of persons having attacks on days with plant damage was also significantly greater than the number on other days (P equals .05). Of the study group, it was decided to characterize eight as smog reactors because their attacks corresponded most often to days showing plant damage. These patients showed no other common characteristics, although seven of the group were females. (Author summary)
APTIC-22075

AIR POLLUTION; OUR ECOLOGICAL ALARM AND BLESSING IN DISGUISE.

Preprint, California Univ., Livermore, Lawrence Radiation Lab., 28p., March 1970. 44 refs.
Hugh W. Ellsaesser.
Identifiers: *Respiratory diseases, *Pollutants, Air pollution episodes, Standards, Epidemiology, Carboxyhemoglobin, Morbidity, Mortality, Circulatory system, Respiratory system, Reproduction, Pulmonary function, Eye irritation, Asthma, Bronchitis, Emphysema, Asbestosis, Oxidants, Particulates, Solid waste disposal, Carbon monoxide, Nitrogen dioxide (no2).

Air pollution is the one feedback signal of man's overgrazing his ecological niche which is capable of spreading an alarm in time to allow preventive action. Other symptoms of overgrazing which have begun to manifest themselves, but are less apparent to the general population than air pollution, are discussed. These include population growth, food supply, energy supply, fresh water supply, supply of natural resources, solid wastes disposal, and social and political problems. A presumptive causal relationship between air pollution and increased morbidity and mortality from chronic and degenerative diseases of the respiratory and cardiovascular systems is accepted as valid. It is believed, however, that there is little evidence that air pollution has had a demonstrable, widespread, harmful effect on human health. The best documented effects are eye irritation, elevation of carboxyhemoglobin levels, impairment of pulmonary function in marginal subjects, aggravation of asthma, worsening of bronchitis, and asbestosis. It is believed that during air pollution episodes, excess mortality is related to prolonged periods of cold, damp weather rather than to air pollution. The oxidant, nitrogen dioxide, carbon monoxide, and particulate levels in several California cities were found to exceed the recommended air quality standards; the validity of these standards is also questioned.
APTIC-22082

CARBON MONOXIDE, BOLLD VISCOSITY AND DEVELOPMENT OF BUERGER'S DISEASE.

Z. Kreislaufforsch., 57 (8):790-792, 1968. 6 refs.
P. Solvsteen, and P. F. Kristjansen.
Identifiers: *Viscosity, *Buerger's disease, *Carboxyhemoglobin, Humans, Body fluids, Smoking, Diseases and disorders, Europe, Fluid flow.

It is well known that Buerger's disease occurs more frequently among smokers than nonsmokers. Patients suffering from Buerger's disease have a high carbon monoxide content in the blood. An investigation was conducted to determine if CO is able to increase the viscosity of the blood. This might cause reduced velocity in the blood vessels and thus reduce the oxygen tension in the tissues and increase the tendency of thrombi to form. For each experiment, 20 ml of blood were collected from a healthy person; 20 mg ethylenediaminetetraacetic acid was added as anticoagulant. The blood was distributed in two tubes. Through one atmospheric air was bubbled; through the other, atmospheric air containing 0.3% CO. After 20 minutes of bubbling, the viscosity was read by a viscometer. Carbon monoxide does not significantly change the viscosity at the shear rates used. When comparing blood without CO and blood with a CO tension of 2mm Hg, no difference in viscosity was observed. The CO tension applied was much higher than in smokers. Therefore, the supposition that CO, by changing the viscosity of blood, may contribute to the development of Buerger's disease, can be discounted.
APTIC-22086

AIR POLLUTION IN A LONDON SMOG.

For primary bibliographic entry see Field 05.
APTIC-22102

AIR POLLUTION BY METALLURGICAL INDUSTRIES.

For primary bibliographic entry see Field 04.
APTIC-22118

INNOVAN-N2O ANAESTHESIA IN NORMAL MEN: EFFECT ON RESPIRATION, CIRCULATORY DYNAMICS, LIVER FUNCTION, METABOLIC FUNCTIONS, ACID-BASE BALANCE, AND PSYCHIC RESPONSES.

Can. Anaesth. Soc. J., 11 (1):41-71, Jan. 1964. 41 refs.
Allen B. Dobkin, Jacob S. Israel, and Peter H. Byles.
Identifiers: *Innovan, *Anesthesia, *Nitrous oxide (n2o), Males, Blood chemistry, Drugs, Circulatory system, Liver, Nervous system, Blood pressure, Metabolism, Pulse rate, Pulmonary function, Ventilation (pulmonary), Ph.

A study was conducted to determine the effects of an intravenous injection of droperidol and fentanyl in the proportion of 1 mg/ml and 0.02 mg/ml, known as Innovan, followed by the inhalation of nitrous oxide and oxygen. The effects on circulatory dynamics, pulmonary ventilation, liver function, and acid-base balance were measured in male subjects. Before and during the experiments blood pressure, pulse rate, pupil size, minute volume, respiratory rate, and oral and axillary temperature were measured and recorded. Innovan with N2O-O2 supplementation produces unconsciousness and depression of the sympathetic nervous system. Cardiovascular depression appears to be minimal and in most of the subjects the cardiovascular system remained stable. Respiratory depression is intense for a short period and mild for a longer period. Hypertonic reactions, affecting the neuromuscular system, appear as spasms of the thoracic, abdominal, and neck muscles, and necessitate the use of relaxants to ensure adequate pulmonary ventilation. No disturbances in liver function and no undesireable metabolic effects were observed in any subject. The changes in

blood pH and carbon dioxide partial pressure showed a general trend to a mild respiratory acidosis. The incidence of nausea and vomiting appears to be negligible after this anesthetic. On the basis of these experiments, Innovan-N_2O appears worthy of extensive trial as a general anesthesia. (Author summary modified)
APTIC-22124

EFFECT OF RESPIRATION ON PULMONARY CAPILLARY BLOOD FLOW IN MAN.

Circulation Res., vol. 22:299-308, Feb. 1968. 24 refs.
Paul Vermeire, and John Butler.
Identifiers: *Breathing, *Pulmonary function, Adults, Males, Females, Blood vessels, Heart, Lungs, Flowmeters, Plethysmography, Nitrous oxide (n2o), Flow rates.

Pulmonary capillary blood flow was measured in 15 male and four female subjects during slow breathing by a modification of the body plethysmograph technique for measuring nitrous oxide uptake. Measurements were made during a slow exhalation and a slow inhalation. The inhalation and exhalation rates were recorded with a flowmeter at the mouth. The pulmonary capillary blood flow was measured at the beginning and near the end of each breath. In seated subjects breathing slowly, flow was significantly higher during inhalation. In supine subjects whose legs were elevated, the difference between inhalation and exhalation was not significant. Flow was usually greater during tidal inhalation than exhalation, but there was considerable variation. The changes in flow were not related to intrathoracic pressures or lung volumes. It is suggested that the amount and pressure of the venous blood available for aspiration into the thorax influences pulmonary capillary blood flow during the respiratory cycle. (Author abstract modified)
APTIC-22125

8. EFFECTS - PLANTS AND LIVESTOCK

DAIRY COW STUDIES USING A DRY AEROSOL (PROJECT ALFALFA) I-131.

Public Health Service, Las Vegas, Nev.,
Soughwestern Radiological Health Lab.,
Memorandum of Understanding SF 54 373, 75p.,
Aug. 1969. 5 refs. CFSTI: SWRHL-42-r
Richard E. Stanley, Stuart C. Black, and Delbert S. Barth.
Identifiers: *Cattle, *Milk, *Ingestion, *Radioactive tracers, Alfalfa, Oats, Aerosols, Iodine, Isotopes, Gamma radiation.

An investigation was conducted to define the mechanisms associated with the transfer of radioiodine from the environment to cow's milk. Growing alfalfa-oats, hay, and spread green chop were contaminated with a diatomaceous earth aerosol labelled with I (131). Three groups of dairy cows were fed the three types of contaminated forage. Another group was directly exposed to the aerosol for an air uptake study. It was concluded that the major portion of radioiodine in cow's milk is usually due to ingestion of contaminated forage. When exposure is limited to air uptake, the expected peak milk activity is almost two orders of magnitude less than that resulting from ingestion of contaminated forage. When different forage types are exposed to an I (131) aerosol, the greatest amount of activity/kg is deposited on the type presenting the most surface area, which is usually growing forage. Following ingestion, peak radioactive concentrations occur in the milk with two days, and are at least one order of magnitude less than the peak activity of the ingested material. When intake of I (131) stops, its effective half-life is approximately one day. There appears to be an inverse relationship between the particle size of the contaminant and the milk to the forage ratio.
APTIC-15595

INVESTIGATION AND APPRAISAL OF FLU-GAS DAMAGE.

(Untersuchung und Begutachtung von Rauchschaden. Part I.), Translated from German. Hamburg Staatsinstitut fur Angewandte Botanik Jahresbericht, 5 (119-120), 1938. 3 refs.

Identifiers: *Fruits, *Plant damage, *Stack gases, *Fluorine compounds, Plants (botany), Europe, Germany, Combustion products, Combustion gases, Industrial emission sources, Fertilizer manufacturing, Stacks, Analytical methods, Chemical methods, Microscopy, Acids, Inorganic acids, Nitric acid, Nitrous acid, Sulfuric acid.

Plants exposed to flue gas showed definite damage from fluorine (F) and acids of sulfur and nitrogen. A crystalization method utilizing the microscopic identification of silico-sodium fluoride proved best for qualitative fluorine analysis of the 102 samples examined through 1936. As in previous studies, the samples tested showed that F was taken in through the branch bark and leaves of cherries and pears. For the first time, however, the fruit itself was damaged and F detected there. Black, hard disks had formed around the flower and in the fruit adjacent to the flower. Samples examined long after damage took place showed no F present. Twenty-one samples were examined for acid damage. Large concentrations of nitrates were detected in the specimens by means of the diphenylamine-sulfuric acid reaction. Different plant species showed markedly different sensitivities to flue gases.
APTIC-18226

PLANT MORPHOLOGY.

(Morphologie Vegetale - Structure et evolution des bourgeons neoformes in vitro. Bourgeons neoformes sur hampe florale chez le Nicotiana sylvestris en photoperiode inductive.) Translated from French. C R Acad. Sci., Paris, Ser. D., p. 1482-1484, November 13, 1967. 6 refs.
J. Diomaiuto-Bonnand, and D. Nicolas-Prat.
Identifiers: *Tobacco, *Plant growth, Plants (botany), Crops, Europe, France, Light radiation.

The evolution of neoformed buds in Nicotiana sylvestris was studied in the inductive photoperiod, under conditions most favorable for the initiation of floral buds of Nicotiana tabacum Wisconsin 38. Grown in vitro in a nutritive Knop composition containing agar and glucose and illuminated from 9 to 16 hours per day, plant fragments were analyzed at regular intervals using standard histological techniques. Fragments taken from the plants formed buds from the resulting callus. The morphological appearance of the buds was independent of glucose concentration in the growth medium, length of lighting periods, and place of sampling in inflorescence. Eight plates show views of sectioned specimens. Although formed in euperiod in composition rich in sugar, the buds were vegetative and comparable to those formed in dysperiod in a composition poor in sugar. Observations indicated that glucose does not cause flowering in vitro but favors it when induced. The evolution of neoformed buds is similar to the growth of apical meristems of entire plants until the reproductive phase, when the meristem stops functioning and becomes parenchymatous, and leaves yellow and wither.
APTIC-18227

METHODS USED FOR THE PREVENTION OF WEAR AND TEAR AND DUST ON HIGHWAYS AND THEIR EFFECT ON VEGETATION.

(Die gegen die Abnutzung und den Staub der Strassen angewendeten Verfahren und ihre Wirkung auf die Vegetation.) Translated from German. Zeitschrift fuer Pflanzenkrankheiten (Pflanzenpathologie) und Pflanzenschutz, p. 193-204, 1912. 19 refs.
C. L. Gatin.
Identifiers: *Plant damage, *Tar, *Streets, *Coal tars, Plants (botany), Crops, Leaves, Trees, Mottling, Europe, France, Germany, Particulates, Settling particles, Dusts, Suspended particulates, Fumes, Industrial emission sources, Surface coating operations.

The effects upon vegetation of tar and petroleum products used to harden dirt road surfaces were studied. Previous laboratory work had showed various tree leaves, grains, vegetable crops, and flowers to be adversely affected by coal tar and its components, ammonia and organic chemicals such as pyridene. Either direct exposure to vapors in a bell jar or sprinkling with empregnated dust gave brown or black discolorations accompanied by attacks on cells, photoplasm, or chlorophyll. To determine the effects of tar under actual road conditions, several streets in the District of Seine, France, were studied. Most trees lining tarred streets showed harmful effects within a period of two years. Displaying a stunted, crippled appearance and producing poorer young shoots, they had a significantly higher death rate than did specimens near non-tarred road surfaces. Leaves were smaller and fell off earlier. In addition, trees exposed to tar stored less starch than others and showed abnormal or premature cork proliferations on branches. Decorative plants and flowers adjacent to paved streets all died or suffered severe damage. Ensuing laboratory studies on elm, walnut, sycamore, and maple trees as well as rose and lilac bushes showed harmful action to be due to the deposition of tar-empregnated dust on leaves and shoots. Sunlight was found to increase the damage. The deleterious effects formed in the French study were not reported in England and Germany. Because of the long period sometimes necessary for the effects to appear, this did not preclude their existance in these countries. It was recommended that precautionary measures used in the United States be followed. There, harmful components of tar were removed before application, and tar-macadam and bituminous earth surfaces were used.
APTIC-18229

PERTAINING TO THE DIAGNOSIS OF DAMAGE INDUCED BY FLUORINE-FUMES.

For primary bibliographic entry see Field 03.
APTIC-18230

EQUIPMENT FOR THE STUDY OF PHOTOSYNTHESIS IN HIGHER PLANTS.

(Zarizeni ke studiu fotosyntezy vyssich.)
Translated from Czech. Ochrana Ovzdusi, p. 120-125, 1969. 6 refs.
F. Kralovsky, J. Svacha, and J. Paukert.
Identifiers: *Photosynthesis, Plants (botany), Leaves, Plant damage, Plant growth, Respiration, Cell growth, Europe, Czechoslovakia, Particulates, Fumes, Experimental equipment, Experimental methods, Research methodologies, Carbon dioxide.

Equipment has been designed for both the direct method of analysis, which determines the new growth of dry material in isolated sections of leaf tissue, and the indirect, gazometric, method which determines changes in the concentration of carbon dioxide in the atmosphere surrounding the studied object. The apparatus studies the degree to which the photosynthesis of a plant is influenced by the effects of solid industrial emissions by determining changes in the amount of CO_2 taken up by the plant. The equipment provides for measuring amounts of CO_2, conditioning air, determining CO_2 concentration, and carrying out photosynthesis in a controlled chamber. Carbon dioxide concentrations are determined by standard titration. Use has shown the apparatus to be reliable, precise, and flexible.
APTIC-18234

STUDIES OF THE INJURIES OF CROPS AND VEGETABLES THROUGH CHLORINE, NITROGEN DIOXIDE AND SULFUR DIOXIDE.

(Untersuchungen ueber Schaedigungen landwirtschaftlicher und gaertnerischer Kulturpflanzen durch Chlor-Nitrose-und Schwefeldioxydgase). Text in German.
Landwirtsch. Forsch., 4 (1):1-36, 1952. 2 refs.
M. Czech, and W. Nothdurft.

Identifiers: *Plant damage, *Chlorine, *Nitrogen dioxide (no2), *Sulfur dioxide, Alfalfa, Barley, Oats, Wheat, Lettuce, Pinto beans, Potatoes, Spinach, Toxic tolerances, Germany, Sulfur oxides, Solar radiation.

Various crops and vegetables were exposed to sulfur dioxide, nitrogen dioxide, and chlorine in the laboratory and in the field. The plants were afterwards exposed to varying degrees of sunlight. Two series of field experiments were conducted: one with dry plants, and one with plants which were sprinkled with water. The plants were exposed to concentrations of 10 ccm, 100 ccm, and 1000 ccm/cu m space for one hour ten times in a row. Winter rape (Brassica napus oleracea) began to show injuries at gasification with 100 ccm/gas cu m. Nitrogen dioxide was slightly less injurious to this plant than SO2 and C12. Winter rye wheat, barley and oat were highly sensitive to the gases and showed injuries already at concentrations of 10 ccm. Sugar beet began to show injuries at concentrations of 30 ccm of the three gases. Sulfur dioxide and C12 attacked the plant more heavily at day exposure and NO2 at night-time exposure. For potatoes, the toxic dose was between 30 and 100 ccm with NO2 and 10 to 30 ccm with C12 and SO2. Alfalfa, lettuce and beans, too, were less sensitive to NO2 than to the other gases. Of the three species, beans were most resistant. Exposure to sunlight increased the effect of the gases on the plants. Sprinkling at the time of exposure was of disadvantage to the plants.
APTIC-19731

GENETIC VARIANCE AND HERITABILITY ESTIMATES FOR SCOTCH PINE: ENVIRONMENT AND AGE EFFECTS.

For primary bibliographic entry see Field 06.
APTIC-19745

ON THE ACTION OF MERCURY ON VEGETABLE LIFE.

(Sur l'action due Mercure sur la vie vegetale).
Anal. Chem., vol. 22:122-127, 1797. Translated from French. Belov and Associates, Denver, Colo., 4p., June 2, 1970.
Diemar.
Identifiers: *Plant damage, *Mercury compounds, *Oxides, Leaves, France, Lead compounds, Sulfur compounds, Water.

Several experiments were conducted to determine the effects of mercury and mercury oxide on plants. When mint and bean plants were placed next to a bottle of mercury, the leaves and stems were covered with black spots on the third day, and then turned completely black. A mint plant and mercury were placed under a bell-glass whose sides were coated with sulfur. The plant remained intact, indicating that sulfur prevents the harmful effects of mercury. No damage was observed when the mercury was covered with water. The experiments also showed that mercury is not harmful unless it is mixed with water or soil, or is in contact with the roots of the plants. Mercury oxide killed a mint plant when placed in contact with the roots. Beans planted in soil mixed with mercury oxide became feeble and disfigured; beans planted in a mixture of soil and lead oxide continued to grow and were four times as strong as those grown in soil and mercury oxide.
APTIC-19770

ON THE CASE OF INTENSIVE DAMAGE TO A TREE LINED AVENUE BY ESCAPING COAL GAS.

(Uber einen Fall intensiver Schadigung einer Allee durch ausstromendes Leuchtgas).
Pflanzenkrankheit, vol. 10:267-269, 1900.
Translated from German. Belov and Associates, Denver, Colo.
C. Wehmer-Hannover.
Identifiers: *Plant damage, *Combustion gases, Trees, Germany, Coal.

The effects of a coal gas pipeline leak on a tree lined street are discussed. The withering originated in the root system, followed by the death of the bark along the base of the tree trunks. A damage center was established, and the damage decreased with increasing distance from the center. Five trees which were totally destroyed stood next to or opposite each other, so that the center must be between them. This damage center coincided with the position of a gas pipe which crossed the five trees. In spite of hibernation, a few weeks were sufficient to destroy the root system of several trees. A sewer construction project is assumed to be the cause of the sudden gas leak. It is known that coal gas is a plant poison, but little is known about the component in question. The damaging effect during hibernation indicates that this is not the result of plant food intake, but of a penetration of the root system.
APTIC-19771

FLUE-GAS DAMAGE OF VEGETATION IN CORRELATION WITH PATHOLOGY OF METABOLISM.

(Die Rauchgasschaden der Vegetation im Licht der Stoffwechselpathologie). Z. Angew. Chem. (Weinheim), vol. 39:302-304, 1926. 2 refs.
Translated from the German. Belov and Associates, Denver, Colo.
Kurt Noack.
Identifiers: *Plant damage, *Sulfur dioxide, *Reaction mechanisms, Leaves, Chloroplasts, Respiration, Inhibition, Metabolism, Toxicity, Germany, Photooxidation, Solar radiation.

The chain of events in the sulfur dioxide poisoning of green plants was investigated. After determining the natural power of assimilation, the plants were treated in darkness with a 0.0005% solution of sodium bisulfite, were rinsed, and studied for their power of assimilation. A rapidly progressing bleaching and withering of the leaves at increasing oxygen absorption became noticeable. The photooxidative effect of chlorophyll was found to be the intermediate link in the flue-gas poisoning of green plants. A chain of events occurs so that the effect of SO2 is only as an inhibitor of carbonic acid assimilation. The photooxidative energy of chlorophyll is deflected from its normal acceptor, carbonic acid, to another acceptor. These acceptors are offered by the photoplasm and the chlorophyll. Therefore, cell death and chlorophyll bleaching are the consequences of an oxidative process; the SO2 acts only indirectly.
APTIC-19772

DECLINE AND MORTALITY OF SMOG-INJURED PONDEROSA PINE.

J. Forestry, vol. 67:147-149, March 1970. 6 refs.
Fields W. Cobb Jr., and R. W. Stark.
Identifiers: *Plant damage, *Mortality, *Smog, *Ponderosa pine, Trees, Chlorosis, California, Photochemical reactions.

Photochemical smog injury to ponderosa pine results in premature chlorosis, senescence, stunting, and casting of foliage. Observations indicated that smog-injured ponderosa pines in the San Bernardino Mountains were frequently attacked by the western pine beetle and the mountain pine beetle. Studies were initiated to determine the relationship between smog injury and bark beetle attacks. Results showed that trees exhibiting advanced smog-injury symptoms were more frequently attacked by bark beetles than those with less severe symptoms. Thirty-six of the 150 trees studied were killed between 1966 and 1969, all of which were infested with bark beetles before death. All trees with the most advanced symptoms were killed. Eleven trees were infested by the western pine bettle, 5 by the mountain pine beetle, and 4 by both species. These studies also showed that smog injury reduced tree growth, sapwood and phloem moisture, phloem thickness, and phloem carbohydrates. The reduction in moisture content is believed to enhance the success of beetle attack. If the present level of mortality continues, it is expected that only a small number of highly resistant ponderosa pines will be alive within 10-15 years.
APTIC-19843

FRECKLE DISEASE OF BANANA IN HAWAII CAUSED BY PHYLLOSTICTINA MUSARUM (CKE.) PETR.

Ann. Appl. Biol. (London), vol. 62:329-340, 1968. 21 refs.
D. S. Meredith.
Identifiers: *Fruits, *Plant damage, *Fungi, Leaves, Dispersion, Rain.

'Freckle' ('black-spot' disease) of bananas is common on leaves and fruit of Dwarf Cavendish and other varieties in Hawaii, especially after rainy periods. On fruit, symptoms may appear 2-4 weeks after the bunch has opened, and become more severe as maturity is approached. The disease is usually confined to older leaves on affected plants. Freckled tissue contains numerous pycnidia of Phyllostictina musarum and disease was experimentally induced by inoculating leaves and fruit with conidia of this fungus. This appears to be the first record of of successful inoculation with P. musarum. Conidia of P. musarum germinate after 3-6 hr in a film of water on banana peel, appressoria being formed after 18-30 hr. Penetration of the epidermis occurs 24-96 hr after inoculation, and is brought about by an infection hypha which grows from the appressorium. The progressive increase in severity of freckle as fruit matures is due to repeated infection by further conidia of P. musarum, rather than to enlargement of original infections. Some banana clones, including Gros Michel, appear to be resistant to the fungus. Dispersal of P. musarum conidia immediately after discharge from the pycnidium is chiefly by rainwater and dew. Secondary infections contribute greatly to the total number of infections. Conidium dispersal by water often results in the development of characteristic patterns of spotting, chiefly in the form of streaks or circular areas, coinciding with the directions of movement of rainwater and dew. Large numbers of conidia of P. musarum are washed on to fruit in rainwater and dew running from diseased, overhead leaves. (Author abstract)
APTIC-19862

CYTOGENETIC EFFECTS OF HYDROGEN FLUORIDE ON PLANTS.

Fluoride Quart. Repts., 2 (2):76-84, April 1969. 8 refs.
Aly H. Mohamed.
Identifiers: *Plant damage, *Genetics, *Hydrofluoric acid, Corn, Tomatoes, Chromosomes.

Fluorocompounds, either organic or inorganic, are considered to be potential pollutants. These compounds are by-products of various industrial processes, such as the production of phosphate-fertilizers, ceramics, and certain metals such as aluminum. Gaseous hydrogen fluoride is one of the most phytotoxic of the halogen compounds occurring as air pollutants. Fluoride gas in the atmosphere may cause severe damage to plants, even when the concentration is below the level required to produce visible morphological symptoms. Experiments were conducted on tomato plants and maize to determine their reaction to fumigation with hydrogen fluoride gas. Chromosomal aberrations resulted in the tomato plants. Similar cytological results occurred in the maize. HF seems to affect primarily the DNA molecule by blocking its replication, probably through its action on the enzymatic system. (Author abstract modified)
APTIC-19863

ROLE OF LIPID IN THE CELLULOSE SYNTHETASE ENZYME SYSTEM FROM OAT SEEDLINGS.

Plant Cell Physiology (Tokyo), vol. 10:771-785, 1969. 19 refs.
A. Pinsky, and L. Ordin.

Identifiers: *Oats, *Enzymes, *Lipids, Metabolism, Chromatography, Ph.

Particulate fractions making cellulose from UDP glucose were obtained by chromatography of oat seedling cell wall-free homogenates on Sepharose 4B. All particle fractions obtained formed varying proportions of glucolipid and polysaccharide. The optimal pH for cellulose synthesis was about 8. Activity was higher in Tris buffer than in phosphate buffer. Dithiothreitol enhanced the cellulose synthetase activity. Glycerol in the incubation medium had no effect on either glycolipid or polysaccharide synthesis. Treatment of particles with phospholipase A inhibited the enzyme systems in some fractions obtained by Sepharose chromatography and increased them in others. Non-ionic and anionic detergents greatly inhibited the enzymes. Addition of lecithin to detergent-treated particles partially restored enzyme activity. Solubilization of the enzyme with retention of activity was not obtained. (Author abstract modified)
APTIC-19869

BIOSYNTHESIS OF GALACTOLIPIDS BY ENZYME PREPARATIONS FROM SPINACH LEAVES.

J. Lipid Res., vol. 10:623-630, 1969. 21 refs.
J. B. Mudd, H. H. D. M. Van Vliet, and L. L. M. Van Deenen.
Identifiers: *Chloroplasts, *Enzymes, *Lipids, Leaves, Spinach, Europe, Acetone, Ph.

The pH optimum for galactolipid synthesis from UDP-galactose by spinach chloroplasts is 7.2 in Tris-HCl or phosphate buffer. The products include sterol glycosides, trigalactosyl diglyceride (tentatively identified), digalactosyl diglyceride, and monogalactosyl diglyceride in increasing order of quantity. The proportion of monogalactosyl diglyceride decreases and that of digalactosyl diglyceride increases as the pH is lowered. The galactolipid synthesis is quite resistant to elevated temperature; maximal incorporation of galactose from UDP-galactose was observed at 45 C. The proportion of monogalactosyl diglyceride was greater at the higher temperatures. As much as 40% of the galactolipid-synthesizing capability of a spinach leaf homogenate is not sedimented by centrifugation for 60 min at 100,000 g. An acetone powder of spinach chloroplasts contains enzymes which catalyze galactolipid synthesis. This preparation is dependent on added diglycerides in order to make galactolipid, whereas the chloroplast preparation is not dependent on added diglycerides. Molecular species of diglycerides were compared as requirements for galactolipid synthesis. The requirement was satisfied best by the diglycerides of highest unsaturation. Methylation of the free hydroxyl of the diglyceride eliminated the effectiveness. (Author abstract)
APTIC-19870

EFFECTS OF FLUORINE. PERTAINING TO THE FLUORINE CONTENT OF PLANTS (1).

(Fluor-Wirkungen). Federal Inst. of Applied Botany, Hamburg (West Germany), RR-14, p. 42-48, 1967. 10 refs. Translated from German. Belov and Associates, Denver, Colo., 8p., May 26, 1970. (Also: Qualitas Plant. Mater. Vegetabiles, 15 (1):29-36, 1967.)
K. Garber.
Identifiers: *Plants (botany), *Fluorine, Germany, Soils, Absorption.

Several years of research on the fluorine content of plants in non-industrial regions have shown that the natural fluorine content may vary between 0.2 and 2.0 mg/100 g dry matter. The uptake of fluorine from the soil will continue independent of the fluorine content of the soil. From these investigations, it was concluded that fluorine contents higher than the natural values indicate the influence of fluorine emissions. The fluorine contents of various plants are presented in tabular form.
APTIC-19873

PROBLEMS OF DETERMINING THE EFFECT OF GASEOUS CHLORINE IMMISSIONS UPON PLANTS.

Staub (English translation from German of: Staub, Reinhaltung Luft), 29 (9):41-43, Sept. 1969. 4 refs.
CFSTI: TT 69-55002/9
Helmut Bohne.
Identifiers: *Chlorine, *Plant damage, Leaves, Chlorosis, Necrosis, Germany, Stack gases, Hydrochloric acid.

The recognition and detection of the effects of chlorine on plants involve many difficulties. The visible growth inhibition in dense trees and bushes and the asymmetric growth observed in many plants are caused by gaseous chlorine compounds, but these symptoms are also produced by other emissions. A brighter coloration and bleaching of the leaves constitute a clearer indication. The effects of higher Cl-levels produce burns along the leaves extending from the edge into the center of the leaf. Leaf analysis has been regarded as a useful means of detecting the influence of flue gases. Leaf samples were taken in various nonindustrial regions and the chlorine content in the dry substance determined for each plant. The values differed greatly for individual plant species and for cultures of the same species. The results show the impossibility of obtaining a representative plant for the normal content in one culture. The Cl content in strongly bleached and in green leaves of lilac and elder was determined. Both bushes had bleached leaves with lower Cl content than those that showed no external influence. This indicated the effect of bleaching and thus gaseous Cl emissions. It was concluded that different Cl contents in differently damaged leaves of the same plant indicate the effects of Cl damage.
APTIC-19879

STABLE LEAD AND RADIOLEAD (210PB) IN THE 'ARCTIC' FOOD CHAIN.

In: Radioactive Foodchains in the Subarctic Environment. (Annual Report). Helsinki Univ. (Finland), Dept. of Radiochemistry, AEC Grant AT (30-1) 3446, Paper 24, 6p., Aug. 1969. 10 refs.
CFSTI: NYO-3446-13
P. Kauranen, T. Jaakkola, and J. K. Miettinen.
Identifiers: *Foods, *Ingestion, *Lead compounds, Animals, Humans, Plants (botany), Hematology, Blood cells, Europe, Spectrophotometry, Absorption, Isotopes, Radioactive radiation.

The concentrations of stable and radioactive lead in the arctic food chain were determined. Lead was measured by an atomic absorption spectrophotometer. In lichen samples from Lapland, the radiolead concentration was slightly higher, and the stable lead concentration significantly lower than in samples from southern Finland. The specific activity of lead in lichen from Lapland is very high, over 1000 pCi/mg; in southern Finland, the specific activity is 300 pCi/mg. In reindeer samples, specific lead activities between 700 and 1000 pCi/mg were found. Results from human samples indicate that the average stable lead concentration of blood is about the same in Lapps and in southern Finns; the radiolead concentration in the Lapps is 2.5 times higher. This is a consequence of the higher specific activity of lead in the arctic food chain, lichen-reindeer-man. The average specific activity of lead in human blood was 47 pCi/mg in Lapps and 20 pCi/mg in southern Finns. It seems that lichen is the source of the high specific activity lead in the arctic food chain, and that the lead gradually become diluted with less active lead from other sources.
APTIC-19881

DISTRIBUTION OF SCOTS PINE FOREST AND SULFUR DIOXIDE IMMISSIONS IN THE RUHR AREA.

Staub (English translation from German of: Staub, Reinhaltung Luft), 30 (1):43-47, Jan. 1970. 13 refs.
CFSTI: TT 70-50047/1
Wilhelm Knabe.
Identifiers: *Trees, *Toxic tolerances, *Sulfur dioxide, Plant damage, Thresholds, Germany.

On the basis of the data obtained in North-Rhine-Westphalia, maximum sulfur dioxide concentrations were determined which could be tolerated by fairly old fir woods. These maximum concentrations in mg/cu m were as follows: a mean annual value of 0.20, mean value for vegetation time of 0.18, upper limit value of arithmetic mean (I1) of 0.14 and expected value of the 97.5% cumulative frequency of the individual values of a measuring year (I2) of 0.75 mg SO2/cu m. It appears that in the case of higher SO2-concentration, any cultivation of firs and pines is pointless, unless some selected emission-resistant trees are planted. The emission standards of I1 equals 0.40 and I2 equals 0.74 mg SO2/cu m is insufficient for protecting these types of trees which are of greatest importance to economy in German forestry. (Author abstract modified)
APTIC-19885

COMBATTING OF THE EXOTELEIA DODECELLA L.

(Bekampfung der Kiefernknospenminiermotte.)
Anz. Schaedlingskunde, 41 (7):106-107, 1968. 5 refs. Translated from German. Belov and Associates, Denver, Colo., 6p., May 16, 1970.
Zbigniew Sierpinski.
Identifiers: *Plant damage, *Pesticides, *Exoteleia dodecella l, Leaves, Trees, Plant growth, Europe.

The Exoteleia dodecella L. is one of the most widely spread forest parasites in Poland. These insects occur in large quantities in young pine cultures on poor soils and within regions of industrial atmospheric pollution. The caterpillars of Exoteleia dodecella L. feed sucessively on 2-3 needles during the late summer and fall and after hibernation in spring. Full grown caterpillars insert themselves by feeding into the buds for their subsequent pupation. Over areas where this insect occurs in large masses, all buds are destroyed resulting in permanent trunk deformations, growth inhibitions of the trees, and formation of dwarf shapes. Because of the damage to large areas of pine forests, Exoceleia dodecella L. is being combatted by contact poisons. It is recommended that this be done in the spring when the caterpillars are leaving the needles and beginning to invade the buds. Best results are obtained with emulsion-type contact poisons, such as 2% Foschlor 30, 2% Tritox 30, and 5% Azotox M 25. Good results are obtained by using these compounds, which can penetrate the inhabited needles and buds and which have a long period of toxicity, and by using the proper equipment.
APTIC-19891

BIOLOGICAL OXIDATION OF GRAPE MUST. II. - A COMPARATIVE STUDY OF SULFUR DIOXIDE AND OF BENTONITE RN AS INACTIVATORS OF GRAPE MUST POLYPHENOLOXIDASE.

(L'oxydation biologique du mout de raisin. II. - Etude comparee de l'anhydride sulfureux et de la bentonite en tant qu'inactivateurs de la polyphenoloxydase du mout de raisin). Text in French. Ann. Technol. Agr., Part I. -Ibid., 16 (1), 1967. 16 (2):81-88, 1967. 15 refs.
T. Ivanov.
Identifiers: *Grapes, *Inhibition, *Sulfur dioxide, *Oxidation, Enzymes, Europe, Food and feed operations, Quinones, Ph.

Grape must comes into contact with oxygen of the air giving rise to a series of oxidation processes, particularly by polyphenoloxydase during its extraction. To produce effervescent and high-grade white table wines, these processes must be inhibited. Knowledge of the manner in which polyphenoloxydase is inactivated by sulfur dioxide and bentonite, previously known to have this effect, is of primary importance. Various doses of SO2 or bentonite were added to the must of the Bulgarian vine varieties 'Red Muscat' and Dimist'. The presence of polyphenoloxydase in the 500 ml must samples was established by quantitative analyses using p-phenylenediamine and

pyrocatechol. The activity of polyphenoloxydase was determined by the purpurogallin method of Willstatter and Stoll modified by Keillin and Mann, with the aid of a Pulfrich photometer. The quinone concentration, the acidity of titration, the redox potential (relative to a hydrogen electrode), and the pH values of nearly all samples were also measured. Data for the untreated samples show that the oxidation of 'Red Muscat' is much more vigorous than that of 'Dimist' and is accompanied by a more rapid increase of the quinone content. Data for treated samples show that the inactivating effect increased with the SO2 content, complete inactivation occurring at contents above 5 grams/hl in samples of 'Red Muscat' and above 1.5 grams/hl in samples of 'Dimist'. The inactivating effect of bentonite increased more slowly, complete inactivation occurring at contents above 150 grams/hl in samples of 'Red Muscat' and above 40 grams/hl in samples of 'Dimist'. Treatment of must with bentonite produces two to five times the volume of the precipitate produced by SO2. In all, SO2 is superior to bentonite with regard to inhibition of must oxidation and is more desirable in vinification.
APTIC-19893

THE INFLUENCE OF AIR POLLUTION ON THE FRUTICULOUS AND FOLIACEOUS LICHEN FLORA AROUND THE SHALE OIL WORKS AT KVARNTORP IN THE PROVINCE OF NARKE.

(Luftfororeningars inverkan pa busk- och bladlavfloran kring skifferoljeverket I Narkes kvarntorp). Svensk Botanisk Tidskrift, 52 (1):133-190, 1958. 56 refs. Translated from Swedish.
Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 79p., Oct. 23, 1969.
Erik Skye.
Identifiers: *Lichens, *Plant damage, *Fuel oils, Plants (botany), Plant indicators, Sweden, Stack gases, Fumes, Oil resources, Stacks, Ground level, Lower atmosphere, Transport, Sulfur compounds.

Fruticulous and foliaceous lichens around the shale-oil works at Kvarntorp near Kumla in the province of Narke were examined to determine if lichens suffer from poisonous gases and, if so, whether there are any suitable indicator species among the lichens as to air pollution. The geographical position and the physical conditions in the district were analyzed with special regard to rainfall and winds. The lichen flora on trees along the road were examined; each station consisted of one or more trees. The growth of lichens on the tree trunks from the base up to a height of 2-1/2 meters was analyzed. Research stations were distributed as regularly as possible across the district. A control area was established about 10 km WSW of Kumla. The study showed a region without a lichen vegetation close by the works, then came a region where the lichens were more or less affected, and only outside this transition zone was an entirely normal vegetation to be found. It was obvious that the oil-works emitted matter which had a detrimental influence on vegetation. This matter was transported by the wind as was evidenced by the fact that trees growing in sheltered areas showed a far richer growth of epiphytes than those in an unsheltered position. Smoke from the oil-works had a double origin, the lofty chimneys and the slag heaps on the ground. Between the active spheres of these two sources a zone of comparatively unpolluted air was formed which was reflected in a less affected flora of lichens which were also more abundant in species. Sulfuric pollution, owing to its frequent occurrence, caused most damage to vegetation. In order to be of use to non-lichenologists, a possible indicator species should be easy to determine and common in a wide area. Furthermore, the species should be neither too sensitive nor too insensitive to air pollution. The following five species could serve these purposes: Anaptychia ciliaris, Evernia prunastri, Parmelia acetabulum, Ramalina fraxinea, and Xanthoria parietina.
APTIC-19894

INVESTIGATIONS ON DIRECTED ACTIVE FLOW AND MATERIAL TRANSPORT IN THE LEAF.

Flora (Jena), vol. 153:358-372, 1963. Translated from German. Belov and Associates, Denver, Colo., 34p., Feb. 20, 1970.
G. Halbwachs.
Identifiers: *Leaves, *Necrosis, *Transport, Thresholds, Toxicity, Europe, Fumes, Hydrochloric acid, Hydrofluoric acid, Sulfur dioxide, Permeability.

Damage by acidic gases, such as sulfur dioxide, hydrochloric acid, and hydrogen fluoride, is expressed in leaves as irregular necrotic spots distributed across the entire leaf surface, or as localized necrosis at the leaf edges and tips. The acidic gases enter the interior of the leaf through the pore openings. Thus, their opening condition is of importance for the extent and speed of damage. Spot-shaped necroses appear in the direct area of the entry locations as a result of tissue damage from high concentrations. Edge and border damage occurs only at low concentrations, which are different for the individual acidic gases, depending on their toxicity. This localization of damage requires transporting the gases toward the leaf edges and tip, and an effective suction at these leaf parts. The existence of such a suction effect, which is significant with respect to the problem of water and substance distribution in the leaf, was made probably by experiments with cut branches, allowing them to absorb dilute HCl and sodium hydroxide solutions and chromium fluorides. The results showed that the preconditions for water and substance flow in the leaf are created by leaf pressure and evaporation, but that the finer distribution in the leaf is regulated by the leaf itself. (Author summary modified)
APTIC-19949

THE IMPORTANCE OF PROTECTION AGAINST IMMISSION FOR VEGETATION.

Staub (English translation from German of: Staub, Reinhaltung Luft), 30 (1):36-42, Jan. 1970. 50 refs.
CFSTI: TT 70-50047/1
Manfred Buck.
Identifiers: *Area emission allocations, *Plant damage, Administration, Air quality criteria, Germany, Stack gases, Sulfur dioxide.

Various possibilities of protecting vegetation against immissions are discussed. Administrative protection measures which may be taken, on the basis of trade regulations, are of particular importance for plant consumers. An optimum vegetation protection can only be achieved by using all the possibilities available, that is, by including adaptation measures on the part of plant consumers, and measures taken in municipal and rural planning. The effectiveness of the emission prevention measures depends essentially on feasible supplementary means (for example, air quality criteria, methods of analysis and assessment of damage, and cultivation recommended in immission zones. The diverse significance of air quality criteria and limiting values for immission are considered, particularly in terms of sulfur dioxide levels. (Author abstract modified)
APTIC-19969

STEADY STATE EXPRESSIONS FOR MATERIAL TRANSFERS IN TWO-COMPARTMENT MODEL ECOSYSTEMS, AND THEIR RELEVANCE TO NATURE.

Proc. S. Dakota Acad. Sci., vol. 48:110-118, 1969. 7 refs.
G. R. Hoffman.
Identifiers: *Ecosystems, *Mathematical modeling, Plant indicators, Meteorology, Cesium compounds, Radioactive tracers.

Ecosystems are extremely complex systems in which plants, animals, and physical environment are coupled in interlocking cause-effect pathways, requiring an understanding of a great many relationships in order to define them. Actual research most often involves detailed analysis of only a part of the system, and a compartment model is often a convenient manner in which to view an ecological sub-system. Some steady state expressions for transfers in a theoretical two-compartment ecological system are discussed. The compartments might represent predator and prey, plant and litter, green plants and herbivore, and so on. The transfers might be thought of in terms of biomass, nutrients, radionuclides, and similar parameters. Mathematical models involving epiphytic cryptogams in relation to the effects of changing climatic gradients, the effects of air pollution, and the role of these plants in accumulating and cycling cesium-137 are presented.
APTIC-19970

CELLULOSE SYNTHESIS IN HIGHER PLANTS FROM UDP GLUCOSE.

Plant Physiol., 43 (3):473-476, March 1968. 9 refs.
L. Ordin, and M. A. Hall.
Identifiers: *Enzymes, *Metabolism, *Cellulose, Oats.

Oat coleoptile sections, 200 in number, were homogenized in 1 ml of 100 mM tris pH 8 plus 4 mM Na2 EDTA in a glass tissue grinder. A 0.2 ml aliquot of homogenate was removed for enzyme assay. The remainder was centrifuged at 1000 g for 5 min. The supernatant solution was recentrifuged at 140,000 g for 1 h. The pellets were resuspended in 1 ml of tris-EDTA and were recentrifuged. The pellets were finally resuspended in O.18 ml of specified solution. A 0.05 ml aliquot of homogenate or high speed pellet was incubated in a total volume of 0.2 containing 4 micromoles MgCl2, 0.4 micromole Na2 EDTA, 10 micromoles tris and 0.7 millimicromole UDP glucose. Incubation was 15 or 30 min at 25 C. Reaction was terminated by heating the diluted mixture in a boiling water bath. The 14,000 g pellet produced 3.5 times more cellobiose than trisaccharide. Only a trace of laminaribio was found. The proportions of cellobiose and laminaribiosyl glucose indicate that the bulk of material must be beta 1,4 glucan. The homogenate produced material which upon hydrolysis yielded 10 times as much cellobiose as trisaccharide. In a second experiment, the 1000 to 25,000 g pellet was washed once respectively with previously prepared boiled or fresh 140,000 g supernatant solution. It displayed properties similar to those of the homogenate. These and further data obtained with enzymes prepared in buffer alone or in buffer containing 1 mM dithiothreitol support the concept that UDP glucose may be utilized to form different beta-linked polysaccharides, one of which is cellulose.
APTIC-20542

STUDY OF PHYSIOLOGICAL INDICES OF TREES AND SHRUBS IN RELATION TO GAS AND SMOKE RESISTANCE.

In: AICE Survey of USSR Air Pollution Literature. Effects and Symptoms of Air Pollutes on Vegetation; Resistance and Susceptibility of Different Plant Species in Various Habitats, in relation to Plant Utilization for Shelter Belts and as Biological Indicators. M. Y. Nuttonson (ed.), vol. 2, Silver Spring, Md., American Institute of Crop Ecology, 1969, p. 35-40. (Also: Okhr. Prir. Urale, vol. 5:39-44, 1966.)
A. S. Sitnikova.
Identifiers: *Trees, *Toxic tolerances, Leaves, Plant growth, Photosynthesis, Cell metabolism, Metabolism, Ussr, Combustion gases, Dusts, Smokes, Primary metallurgical processing.

A study was conducted to determine the physiological processes occurring in plants under the influence of smoke and gas. The study was conducted over a four year period in a botanical garden and a metallurgical mill. Trees were studied in relation to growth and development characteristics, water conditions, photosynthesis intensity, carbohydrate and nitrogen metabolism, differential oxidation of cell content, and the dynamics of chlorophyll accumulation. With regard to the growth of shoots, the studied plants can be divided

into two groups. The first, comprising oleaster, Tartar honeysuckle, European white birch, and Hungarian lilac, is characterized by an intense growth in the smoke polluted areas; the second, comprising Scotch pine, box elder, and black locust, had an arrested growth of lateral shoots. The box elder, European white birch, common lilac, and Scotch pine were categorized as weakly transpiring plants. They have a very low transpiration index in smoke polluted area. The oleaster, pinnately-branched elm, and balsam poplar transpire intensely in polluted areas. The smoke-resistant trees had a greater water retention capacity toward the end of the growing period. They also had an increased chlorophyll content and photosynthetic activity. The species studied are arranged in decreasing order of their resistance to smoke and gas: pinnately-branched elm, oleaster, balsam poplar, box elder, Tartar honeysuckle, common lilac, Siberian pea tree, European white birch, and Scotch pine.
APTIC-22064

STUDIES ON THE AIR-ION-INDUCED GROWTH INCREASE IN HIGHER PLANTS.

Advan. Frontiers Plant Sci., vol. 20:115-208, 1968. 57 refs.
Sadao Kotaka, and Albert P. Krueger.
Identifiers: *Plant growth, *Metabolism, *Ions, Barley, Corn, Oats, Lettuce, Chlorosis, Chloroplasts, Enzymes, Inhibition, Greenhouses, Iron compounds, Carbon dioxide, Oxygen.

Experiments were conducted to determine the effects of ionized atmospheres on plant growth. Exposure of oat, barley, lettuce, pea, and maize seedlings to unipolar ionized atmospheres stimulated growth as measured by seedling length, integral elongation, and fresh and dry weight. The extent of growth increase was related to the ion density. No alterations were observed in the composition of the ion-treated oat or barley. The growth promotion reflects an increased metabolic activity, but does not produce an increase in any specific components of the exposed plant. Moderate densities of 02 (-) or 02 (+) ions in air containing an added 8% of oxygen accelerated the growth rate. The same number of CO2 (-) and CO2 (+) ions in air containing 8% CO2 inhibited growth, impeded chlorophyll production, and devitalized the seedlings. Hordem vulgaris seedlings grown in a chemically defined iron-free nutrient solution develop iron chlorosis. When the growth occurs in unipolar ionized atmospheres, the onset of chlorosis is accelerated and is accompanied by the appearance of large amounts of cytochrome c. Apparently air ions cause the iron present in the seeds to be used in the synthesis of cytochrome c and not enough is available to support the normal biosynthesis of chlorophyll. Air ions enhanced the incorporation of iron into early germinating barley seeds. This supports the hypothesis that air ions affect the biosynthesis of heme compounds and iron-containing enzymes. (Author summaries modified)
APTIC-22081

FLUORINE LEVELS IN CROPS OF THE DALLES AREA IN 1962 AND 1963.

Oregon Agricultural Experiment Station.
Corvallis, Special Rept. 187, 37p., 1965. 8 refs.
O. C. Compton, L. F. Remmert, and W. M. Mellenthin.
Identifiers: *Plant damage, *Fluorine, *Leaves, Alfalfa, Fruits, Trees, Necrosis, Oregon, Primary metallurgical processing, Air quality measurements, Seasonal.

The fluorine content of forage or foliage of alfalfa, apricot, sweet and sour cherry, grape, peach, and prune crops grown in The Dalles area in Oregon in 1962, and of alfalfa, cherry, and peach crops in 1963 are reported. These data are compared to similar data obtained periodically since 1953. Leaf samples collected in July 1962 ranged from 4 to 362 ppm fluorine, averaging 31 ppm. Samples collected in October ranged from 17 to 474 ppm, averaging 92 ppm. Similar samples from the Corvallis area had less than 15 ppm fluorine. Alfalfa forages from The Dalles area averaged 31 ppm in July and 81 ppm in October with maximums of 84 and 166 ppm, respectively. A marginal necrosis characteristic of fluoride injury was found on apricot leaves, with the weaker trees showing the most severe injury. In June 1963, sweet cherry leaf samples ranged from 4 to 34 ppm, averaging 13 ppm fluorine, while those collected in September ranged from 9 to 72 ppm, averaging 22 ppm. Similar samples taken in July and October 1962 averaged 32 and 95 ppm, respectively. Fluorine in the air was determined on a few samples in 1963. The amounts varied from none to 12.9 micrograms fluorine/cu m of air varying with the location and season. The data are insufficient to relate air and foliage fluoride. (Author summary modified)
APTIC-22084

FLUORINE LEVELS IN CROPS OF THE DALLES AREA IN 1964.

Oregon Agricultural Experiment Station.
Corvallis, Special Rept. 204, 21p., 1965. 5 refs.
O. C. Compton, L. F. Remmert, and W. M. Mellenthin.
Identifiers: *Trees, *Fluorine, Fruits, Leaves, Aluminum, Primary metallurgical processing, Air quality measurements.

In 1964, the fluorine content of sweet cherry leaf samples collected in July ranged from 4 to 31 ppm, averaging 11 ppm. Samples collected in September contained from 6 to 52 ppm fluorine, averaging 19 ppm. The data for peach trees were similar. Even though these fluorine levels were much lower than in 1960-62, the effect of distance and direction from the aluminum reduction factory is evident. There was no discernible trend in fluorine levels because of location within The Dalles area before the opeation of the factory. Fluorine samples from the air varied from none to 2.5 micrograms/cu m of air. The relationship between the fluorine in the air and in foliage of Royal Ann cherry trees indicated that the higher the air fluorine, the greater was the leaf fluorine content. (Author summary modified)
APTIC-22085

RUMINAL INSUFFLATION WITH NITROGEN DIOXIDE IN CATTLE.

Cornell Vet., vol. 57:123-128, Jan. 1967. 9 refs.
Randall C. Cutlip.
Identifiers: *Cattle, *Toxicity, *Nitrogen dioxide (no2), Acute, Chronic, Pathological techniques, Bronchi, Alveoli, Epithelium, Emphysema, Pulmonary edema.

An investigation was conducted to study the signs and pathologic alterations in the bovine species by ruminal insufflation with nitrogen dioxide. Four yearling Holstein-Friesian heifers were surgically equipped with rumen cannulas for introducing the NO2. Two animals were acutely poisoned and two were chronically poisoned. The upper respiratory tract of the acutely poisoned animals were hyperemic; no changes were seen in the chronically poisoned animals. Pulmonary lesions were similar in both the acutely and chronically affected animals, but less severe in the latter. Mild bronchial and bronchiolar epithelial hyperplasia, hyperemia, edema, atelectasis, and emphysema were observed. There was extensive coagulative necrosis of the rumen near the cannulas. The skeletal muscles were swollen and contained areas of early degenerative changes. Coagulative necrosis of the proximal convoluted tubules of the kidneys was also prominent. Small focal hemorrhages and mild passive hyperemia were found on histologic examination of the brain. No hyperplasia of alveolar epithelial cells occurred as is characteristic od adenomatosis. Thus, rumen-origin NO2 probably is not involved in bovine pulmonary adenomatosis.
APTIC-22087

FLUORINE LEVELS IN 1961 CROPS OF THE DALLES AREA.

Oregon Agricultural Experiment Station,
Corvallis, Special Rept. 153, 25p., 1963. 6 refs.
O. C. Compton, L. F. Remmert, and W. M. Mellenthin.
Identifiers: *Fruits, *Leaves, *Plant damage, *Fluorine, Alfalfa, Trees, Necrosis, Aluminum, Oregon, Primary metallurgical processing, Crop spraying, Chlorides, Fluorides, Calcium compounds, Seasonal.

The fluorine content of the foliage or forage of alfalfa, apricot, cherry, sour cherry, grape, peach, and prune crops grown in The Dalles area in Oregon during 1961 are reported. These data are compared, in tabular form, to similar data obtained previously. Leaf samples collected from the crops in July 1961 ranged from 12 ppm to 217 ppm fluorine, averaging 65 ppm. Samples taken in September ranged from 16 to 204 ppm, averaging 68 ppm fluorine. Leaf Scorch on apricot trees and soft suture on peaches were observed. These conditions were noted in 1959 and 1960, but not before the operation of an aluminum factory located in this area. The effects of calcium chloride and fluoride spray treatments were also investigated. (Author summary modified)
APTIC-22092

EXPERIMENTAL STUDIES OF THE RETENTION, DISTRIBUTION AND METABOLISM OF CARCINOGENIC HYDROCARBONS IN THE RESPIRATORY ORGANS OF THE SYRIAN GOLDEN HAMSTER.

(Experimentelle Untersuchungen ueber Aufnahme, Abtransport und Abbau cancerogener Kohlenwasserstoffe im Bereich des Respirationstrakes). Text in German. Z. Krebsforsch., vol. 71:225-243, 1968. 27 refs.
W. Dontenwill, H. Elmenhorst, G. Reckzeh, H.-P. Harke, and L. Stadler.
Identifiers: *Lungs, *Carcinogens, *Hydrocarbons, Hamsters, Metabolism, Retention, Lung cancer, Germany, Aerosols, Absorption.

To administer carcinogens intratracheally, suspensions of the carcinogens must be homogeneous, since with nonhomogeneous suspensions (for instance, benzpyrene-haematite in water) an exact dosage becomes difficult. Solutions in Lutrol and suspensions in CMC + saline can be dosed with good reproduceability. To obtain a uniform distribution of the carcinogen in the lungs, the exact position of the cannula in the trachea and an injection volume as small as possible are decisive. With application of aerosols, a diffuse distribution in the respiratory tract is guaranteed, but only very small amounts of the carcinogen reach the lungs. These small amounts seem insufficient to produce carcinomas. When true solutions of the carcinogen are administered, the major part of the carcinogen disappears from the lungs after 2 days and from the body after 5 days. DMBA is resorbed from the lungs more quickly than benzpyrene. A small part of the hydrocarbons is excreted unchanged in the faeces. Benzpyrene dissolved in Lutrol is resorbed most rapidly. The rate of resorption of benzpyrene in sesame oil is almost in the same range. The addition of soot to the Lutrol-benzpyrene solution slightly inhibits the resorption process. Benzpyrene in CMC-saline suspension is resorbed from the lungs more quickly than benzpyrene. A small part of the hydrocarbons is excreted unchanged in the faeces. Benzpyrene dissolved in Lutrol is resorbed most rapidly. The rate of resorption of benzpyrene in sesame oil is almost in the same range. The addition of soot to the Lutrol-benzpyrene solution slightly inhibits the resorption process. Benzpyrene in CMC-saline suspension is resorbed considerably more slowly, as is benzpyrene applied with haematite in saline. It is supposed that in these suspensions, only minimal amounts of the carcinogen are always in solution, or are dissolved by body liquids or cellular processes. Pretreatment of the lung tissue with soot injections or soot aerosols inhibits the resorption of the carcinogens subsequently given. The

occurrence of 8-hydroxybenzpyrene in the faeces indicates that the disappearance of hydrocarbons from the organism of the hamster is due to enzymatic conversion into metabolites. A few minutes after application, haematogenous generalisation of the carcinogens already has taken place. The difficulties of the dose-response-relations in the production of carcinomas in the lungs are discussed in comparison with other organs. The numerous factors which may influence the action of carcinogens in the respiratory tract are also analyzed. (Author abstract)
APTIC-22105

9. EFFECTS - MATERIALS

A COMPARISON OF THE IEC, DUST/FOG, AND INCLINED PLANE TESTS.

IEEE (Inst. Elec. Electron. Engrs.) Trans. Elec. Insulation, EI-3 (2):33-39, May 1968. 10 refs.
Malcolm J. Billings, Robert Wilkins, and Leonard Warren.
Identifiers: *Synthetic fibers, *Iec comparative tracking index, *Astm dust/fog test, *Astm inclined plane test, Materials, Materials deterioration, Textiles, Europe, Great britain, Measurement methods, Simulation.

Because they are susceptible to degradation, organic polymers have not been widely used as insulation for outdoor electrical equipment. Precipitation of carbon from the degradation of the synthetic material may occur, giving rise to the phenomena known as tracking or a slower failure may result from the release of volatile products, resulting in erosion. To develop better organic polymer materials, it is desirable to have a test or series of tests that will classify materials such that small differences in constituents can be noted. The Intern. Electrotech. Comm. (IEC) Comparative Tracking Index, the ASTM Dust/Fog test, and the ASTM Inclined Plane tests are three methods that attempt to simulate the surface discharge conditions existing on outdoor insulation. They have been compared to each other and to outdoor test results obtained for an insulator at a stress of 1 kV. Materials used for comparison studies were filled and unfilled epoxide resins cured with acid anhydrides. To specify the conditions under which the tests can be compared and to note discrepancies existing between the differentiation of tracking and erosion under modified conditions. It is shown that the IEC test will measure the erosion rate of better materials at one voltage over a 24-hr period. Correlation to the ASTM Dust/Fog test is good. The latter can differentiate between slight modifications in a material, but needs frequent inspection and a skilled operator. If the scintillation current is maintained at 15mA, variability of the results is reduced. The Inclined Plane Test cannot detect differences in tracking times or erosion rates of epoxide resins with normal or increased quantities of the wetting agent. Voltages below three and 2.75 kV make maintenance of regular scintillation difficult.
APTIC-18205

AIR POLLUTION AND COUNTERMEASURES FOR INTERNATIONAL TELECOMMUNICATIONS EQUIPMENT.

(Kokusai denkitsushinsetsubi no kukiosen to taisaku). Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo), 3 (6):45-51, 1966.
Translated from Japanese. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 20p., Dec. 3, 1969.
M. Kobayashi, Tatsuro Mikami, and Yasuhiro Senda.
Identifiers: *Materials deterioration, *Surface coatings, *Solvents, Smoking, Corrosion, Discoloration, Metals, Japan, Dusts, Smokes, Non-industrial emission sources, Electrostatic precipitators, Simulation, Ions.

Palladium contactors for the international telecommunications switchboard were stained at contact points, lowering the efficiency of the mechanism and shortening its working life. The analysis of the stains led to the suspicion that organic as well as inorganic substances and dust particles in air contributed to staining by chemical reaction due to sparks and frictions. The investigation of the atmosphere showed that minute positively charged dust particles pass through the electrostatic dust collectors and are likely to adhere to the negative contact points. Oleagenic floor wax emits gases that contain much turpentine oil and the gases enter the switchboard room through the air conditioning system. In addition, multipanel oil was also suspected of causing some damage. Simulation in the specially constructed dust chamber showed that the charged particles and multipanel oil as well as inorganic gases cause no damage, but cigarette smokes, large fibrinous dust particles and especially the gases from the oil wax are detrimental to the contactors. The solution to the problem of the stained contactors was to alter the general method of cleaning the floor by changing from oil wax to water wax, and to take sufficient caution while the building is being repainted.
APTIC-22078

EFFECT OF MOLTEN NITRATES OF LITHIUM, SODIUM, AND POTASSIUM ON NICKEL, COPPER, DURALUMIN, AND CERTAIN STEELS.

(Deystviye rasplavlennykh nitratov litiya i kaliya na nikel', med', dyural' i nekotoryye stali). Text in Russian. Zh. Prikl. Khim., vol. 29: 1358-1356, 1956. 26 refs.
Ye. I. Gurovich.
Identifiers: *Corrosion, *Aluminum, *Steel, *Nitrates, Copper, Nickel, Ussr, Lithium compounds, Potassium compounds, Sodium compounds, Liquids, Vapors, Surface properties.

The effects of lithium, sodium, and potassium nitrates were studied on nickel, copper, Duralumin, ER-lt stainless steel, refractory steel No. 2 (Fe-Cr-Al type), and carbon steel No. 2 at 400, 450, and 500 C. Corrosion effects in the melts, in vapor, and at the boundary between these phases were studied. Film formation occurred in every case with carbon steel, and with all metals (excluding copper) in combination with lithium nitrate. In all other cases the test metals were subject to dissolution. These film formations are seen as a means of decoration or of preparing the metal surface to receive other surface coatings.
APTIC-22099

DURABILITY OF METALS UNDER OPERATING CONDITIONS IN VARIOUS SULFUR REMOVAL EQUIPMENT.

(Stoykost' metallov v usloviyakh raboty ryada appa ratov seroochistki). Text in Russian. In: Korroziya i iznos konstruktsionnykh materialov khimicheskogo mashinostroyeniya. F. F. Khimushina, (ed.) Moscow, 1958, p. 111-132. 10 refs.
F. B. Slomyanskaya.
Identifiers: *Corrosion, *Metals, *Absorption (general), Aluminum, Steel, Lead alloys, Ussr, So2 removal (combustion products), Ammonium compounds, Sulfites, Gases, Liquids, Temperature.

The corrosion resistance of metals in saturated and regenerated sulfite-bisulfite solutions at 20-95 C was studied. Type Kh18N12M2T steel was the most durable metal tested and is recommended for lining absorbers. Aluminum was found suitable for contact with liquid and gaseous phases in the absorber; double cladding is recommended for parts subject to heavy wear. At operating temperatures below 50 C, aluminum alloy Al4 is recommended for use in contact with saturated ammonium sulfite-bisulfite solutions; aluminum, or any of its silicon alloys, with regenerated solutions. Copper content of the aluminum alloys should be minimal. Support elements in filter presses may be made of 1Kh18N9T steel. Lead containing 0.5% antimony is recommended for the construction of coolers operating in regenerated ammonium sulfite-bisulfite solution at 90-95 C.
APTIC-22128

10. ECONOMIC ASPECTS

THE ECONOMICS OF AIR POLLUTION: CENTRAL PROBLEMS.

For primary bibliographic entry see Field 12.
APTIC-18215

INCENTIVES TO AIR POLLUTION CONTROL.

For primary bibliographic entry see Field 12.
APTIC-18221

TECHNICAL AND ECONOMIC CONSIDERATIONS FOR THE SELECTION OF SURFACE AND IN-GROUND STORAGE FOR LNG.

For primary bibliographic entry see Field 02.
APTIC-19793

11. STANDARDS AND CRITERIA

PENNSYLVANIA AMBIENT AIR QUALITY STANDARDS.

6p., Oct. 20, 1969. 10 refs.
Personal Author Not Recorded.
Identifiers: *Pennsylvania, *Maximum allowable concentration, State governments, Regulations, Air quality standards, Annual, Diurnal, Hourly, Monthly, Oxidants, Settling particles, Suspended particulates, Hydrofluoric acid, Sulfuric acid, Beryllium compounds, Lead compounds, Carbon monoxide, Nitrogen dioxide (no2), Sulfur dioxide, Sulfates, Hydrogen sulfide.

Annual, 30-day, 24-hr and/or 1-hr air quality standards are given for 12 pollutants (suspended and settled particulates, lead beryllium, sulfates as H2SO4, sulfuric acid mist, fluorides as HF, sulfur dioxide, nitrogen dioxide, oxidants, hydrogen sulfide, and carbon monoxide) in accordance with the requirements of the Pennsylvania Air Pollution Control Act of 1960. These standards, which will be reviewed at least once a year, are for single-point measurements; they represent minimum, and not necessarily desirable quality. The 24-hr standard for SO2 is 0.10 ppm; for suspended particulates, 195 micrograms/cu m. An antidegradation policy is stated to the effect that where present air quality is significantly higher than the established standards, the difference will be conserved, based on a long range forecast of probable land and air uses in areas of high air quality. Sampling and analytical procedures to be employed for measuring ambient levels are specified for each of the 12 pollutants.
APTIC-19750

PARTIAL AMENDMENT OF THE NOV. 1968 NOTIFICATION NO. 2 OF THE MINISTRIES OF HEALTH AND WELFARE AND OF INTERNATIONAL TRADE AND INDUSTRY SPECIFYING THE EMISSION STANDARDS FOR DESIGNATED AREAS UNDER THE PROVISIONS OF THE AIR POLLUTION CONTROL LAW.

(Showa 43 nen 11 gatsu koseisho tsushosangyo sho kokuji dai 2-go: taiki osen boshiho no kitei ni motozuku shitei chiiki ni kakawaru haishutsu kijun, no ichibu kaisei). Text in Japanese.
Notification No. 3 of the Ministries of Health and Welfare and of International Trade and Industry.
5p., Dec. 25, 1969.
N. Saito, and M. Ohira.
Identifiers: *Sulfur oxides, *Regulations, *Emission standards, Abatement, Federal governments, Legislation, Japan, Urban areas.

A notification is presented which essentially effects the changes in the emission standards for districts specified under the Air Pollution Control Law with respect to sulfur oxides. A table is included indicating the changes for each of the districts, with old and new allowable values for the K-values as well as the ground concentration in ppm.

APTIC-19782

RESULTS OF QUESTIONNAIRE SURVEY ON COMMUNITY AIR QUALITY STANDARDS CONDUCTED AMONG STATE AND LOCAL AIR POLLUTION AGENCIES.

For primary bibliographic entry see Field 12.
APTIC-19784

RELATING AIR POLLUTANT EFFECTS TO CONCENTRATION AND CONTROL.

National Air Pollution Control Administration, Durham, N. C., Office of Criteria and Standards. 43p., 1969 (*). 31 refs.
Ralph I. Larsen.
Identifiers: *Air quality measurements, *Air quality standards, Plant damage, Mortality, Urban areas, Odors, Oxidants, Dusts, Visibility, Hydrocarbons, Mercaptans, Carbon monoxide, Nitric oxide (no), Nitrogen dioxide (no2), Sulfur dioxide, Carbon disulfide, Abatement, Continuous air monitoring program (camp), Criteria, Air quality criteria, Governments, Standards.

Examples are cited relating air pollutant effects to concentration and control. The examples are organized under a dozen possible steps that could be used to proceed from air quality criteria to clean air. The purpose is to offer assistance to State, regional, and local air managers and their air management boards in deriving the air quality standards and emission standards needed to prevent various unwanted pollutant effects. Numerous tables and statistics are given. The air pollution problem from the common combustion pollutants is similar in both large and small cities. If 95% emission reduction were needed for nitrogen oxides control in a city of 1,000,000, then indications are that 90% reduction would be needed to achieve the same air quality standard in a city of only 1000. If similar emission standards were used in both large and small cities, the citizens of the small cities would enjoy slightly cleaner air with fewer of the objectionable air pollution effects. Tables are presented for concentrations of carbon monoxide, hydrocarbons, nitric oxide, nitrogen dioxide, oxidants, and sulfur dioxide at various urban locations. The relationships between air polution and excess mortality particularly with SO2 and plant damage are discussed.
APTIC-20560

ON THE AMBIENT STANDARDS FOR CARBON MONOXIDE.

(Issankatanso no kankyo kijun ni tsuite). Text in Japanese. Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo). 8 (1)52-53. April 1970.
Noboru Yamate.
Identifiers: *Carbon monoxide. *Air quality standards. Diurnal. Japan. Automotive emissions. Industrial emission sources. Automobiles. Continuous monitoring. Infrared spectrometry.

The Ambient Standard for Carbon Monoxide established in Feb. 1970 is explained. Considering the specific effect which carbon monoxide (CO) has on human health. two basic requirements are to be maintained perennially. The CO level should be below 20 ppm/hr averaged over eight successive hours. and it should also be below 10 ppm/hr averaged over 24 successive hours. The ambient standard is to be applied to wherever people carry out their daily activities. except for places reserved for driving and storing automobiles. The meausrements are to be conducted by a non-dispersive infrared analyzer. and continuous monitoring is desirable with hourly collection and organization of data. Places for conducting the measurements are to be chosen as as to provide meaningful data in terms of the general tendency and effects of polluted atmosphere. The countermeasures against CO are to be directed not only toward automobiles but also to often overlooked industrial sources. In evaluating the level of CO from motor vehicles. the significance and the totality of control measures against exhaust gases must be taken into consideration. Other control and preventative measures include stricter enforcement of emission standards. better inspection systems, improvement of traffic control systems, promotion of more advance driving techniques, better monitoring problems, and the promotion of research and development.
APTIC-22028

12. LEGAL AND ADMINISTRATIVE

THE ECONOMICS OF AIR POLLUTION: CENTRAL PROBLEMS.

Law and Contemporary Problems. 33 (2):227-238. Spring 1968. 24 refs.
Harold Wolozin.
Identifiers: *Air resource management. *Economic losses. *Costs. *Abatement. Animals. Humans, Plants (botany). Administrative and social, Socio-economic factors.

The problems economists have encountered in attempting to develop measures and tools to cope with the growing costs to society of air pollution have been surveyed. Current estimates of total damage caused by air pollution are ureliable. Effective policy determination requires serious and substantially supported efforts to estimate the costs of air pollution and the benefits of abatement over a range of pollution levels. Because air pollution is only one of several components of the deterioration of man's environment, a cost/benefit analysis should evaluate it in relation to the total system. This is a discussion of the state of the art of measuring the costs and determining economic measures to stimulate and/or coerce polluters to eliminate or cut down on emissions.
APTIC-18215

A GUIDE TO THE AIR QUALITY ACT OF 1967.

Law and Contemporary Problems. 33 (2):239-274. Spring 1968. 141 refs.
Robert Martin, and Lloyd Symington.
Identifiers: *Air quality act of 1967. *Legislation. *Emission standards. Sources. Fuels. Control methods. Fuel additives. Sulfur oxides. Administrative and social. Abatement. Administration. Plans and programs. Control programs. Research programs. Advisory services Air resource management. Costs. Air quality criteria. Enforcement procedures. Governments. Federal. Regional. State. Legal aspects. Hearings. House. Senate. Clean air act. Air quality standards. Emission.

The scope of the Air Quality Act of 1967 and the ultimate effects in controlling air pollution attributable to stationary sources of contaminants are discussed in detail. The act provides a number of excellent tools to government and industry for meeting the nation's air quality needs. If properly administered. and adequately funded. it should produce in a reasonable period of time a significant improvement in the nation's air quality with a minimum of economic disruption. This is because the approach taken has in fact been comprehensive. as HEW urged: because. in the absence of compelling health considerations. regulation must be geared to technological and economic feasibility. as industry urged: and because research has been given a major impetus. as everyone urged. The appropriate use of the advisory committees and implementation of the act's provisions for broad participation in all conferences and hearings should promote a cooperative atmosphere. If both industry and government at all levels do their respective parts. this should result in voluntary compliance with scientifically sound economically realistic regulations.
APTIC-18216

DEFICIENCIES IN THE AIR QUALITY ACT OF 1967.

Law and Contemporary Problems. 33 (2):275-296. Spring 1968. 15 refs.
John E. O'Fallon.
Identifiers: *Federal. *State. *Local. *Governments. *Control agencies. *Emission standards. *Budgets. United states. Industrial emission sources. Administrative and social. Administration. Costs. Legal aspects. Legislation. Personnel. Air quality standards. Emission.

The Air Quality Act of 1967 is not the strong decisive instrument needed to bring about an immediate. significant reduction in air pollution levels. While the increased research and development activity. funding to local and state agencies. emission controls for motor vehicles. and knowledge-expanding projects provided for in the Act are commendable. the lack of emphasis on immediate utilization of existing technology to bring industrial sources of pollution under control severely weakens the Act. Failure to make full use of the tools available or to impose emission controls on industry greatly weakens the Act. The Act sponsors the delay of action problems while definite data on the extent of the problem is accumulated. Present technology should be forced into application by imposing emission controls on industry. Relative qualifications and records of achievement of local and state air pollution control agencies should have dictated delegation of responsibility for action programs. It is wishful thinking to expect to force states to enter the enforcement field and act to do a job as quickly or as well as local agencies that have been doing it for years merely by empowering the states to do it. The delegation of too much political power to the states could act as a deterrent rather than a stimulus to the accomplishment of the intended objectives of the Act. The Air Quality Act of 1967 does not fully recognize the urgency of the air pollution problem. (Author summary modified)
APTIC-18217

CONTROL OF AUTOMOBILE EMISSIONS--CALIFORNIA EXPERIENCE AND THE FEDERAL LEGISLATION.

Law and Contemporary Problems. 33 (2): 297-314. Spring 1968. 71 refs.
Harold W. Kennedy. and Martin E. Weekes.
Identifiers: *State. *Legislation. *Automotive emissions. California. Pollutants. Automotive exhausts. Crankcase emissions. Administrative and social. Control agencies. Costs. Enforcement procedures. Governments. Legal aspects. Air quality standards. Emission. Abatement.

In order to combat air pollution emanating from the automobile. California in 1960 enacted the Motor Vehicle Pollution Control Act. An analysis of this and subsequent legislation is made. The interrelationships of local. state. and federal legislation are discussed. Many automobiles currently operating on the highways of the several states within the United States were manufactured prior to model year 1968. These automobiles will continue to function for a great many years. The state of California has adopted a system of legislation which is presently designed primarily to devise methods by which air pollution from these automobiles may be controlled. The California Legislature has not been unmindful of the costs to the operator of the motor vehicle of such a pollution control program. At the present time. the California standards for emissions for automobiles manufactured. beginning with the model year 1968. are no more stringent than the federal government's standards. It would appear that in deriving the standards. the Department of Health. Education. and Welfare took the standards for various pollutants recommended by the individual states. and combined them to establish a national standard.
APTIC-18218

STATE CONTROL OF INTERSTATE AIR POLLUTION.

Law and Contemporary Problems. 33 (2):315-330. Spring 1968. 43 refs.
Lewis C. Green.
Identifiers: *State. *Governments. *Regional. *Air resource management. *Legislation. Ad-

ministrative and social, Abatement, Administration, Plans and programs, Control programs, Federal, Legal aspects, Clean air act.

In airsheds which include parts of more than one state, and especially in large metropolitan areas, air contaminants emitted in one state frequently cross the state boundary, and contribute to a condition of air pollution in the receiving state. A consideration of the legal protection available to the receiving state is presented in three contexts: The power of the receiving state under traditional constitutional theory; opportunities afforded to receiving states under federal legislation; and the possibility of control achieved through an interstate compact. It may be that state governments are too much dominated by the influence of special interest groups to make a meaningful contribution to the solution of interstate air pollution problems. If any such contribution is to be made, it would appear that the only avenue offering any hope is through the interstate compact mechanism.
APTIC-18219

LEGAL BOUNDARIES OF AIR POLLUTION CONTROL--STATE AND LOCAL LEGISLATIVE PURPOSE AND TECHNIQUES.

Law and Contemporary Problems, 33 (2):331-357,
Spring 1968. 150 refs.
Lawrence W. Pollack.
Identifiers: *Air quality act of 1967, *Air resource management, *Legal decisions, *Enforcement procedures, Pollutants, Particulates, Suspended particulates, Smokes, Sources, Fuels, Coal, Air quality measurements, Smoke shade, Ringelmann chart, Administrative and social, Education, Governments, Federal, Local, State, Decisions, Legislation, Planning and zoning, Regulations, Air quality standards, Emission, Equipment.

The legal experiences encountered in the development of the various state and local techniques, so that future legislative efforts can be judged and guided accordingly are reviewed. Because recent New York City legislation employs most of the available legislative techniques, it is used throughout this article as an example of source control legislation. The ordinance provisions recommended by the Public Health Service are used as a model of Air Resource Management legislation. Experience has shown that most carefully drafted public health related control techniques are within the legal boundaries established by the U. S. Constitution.
APTIC-18220

INCENTIVES TO AIR POLLUTION CONTROL.

Law and Contemporary Problems, 33 (2):358-368,
Spring 1968. 31 refs.
Paul H. Gerhardt.
Identifiers: *Socio-economic factors, *Taxation, *Enforcement procedures, Sources, Industrial emission sources, Transportation, Administrative and social, Administration, Costs, Economic losses, Fees, Governments, Federal, Legal aspects, Legislation, Regulations.

Air pollution control involves political, economic, and social considerations. The economist's contribution to the discussion of the problem is to attempt an evaluation of some alternative ways in which society might restructure the market process to bring about improved air quality and how these alternatives might compare with direct regulation and enforcement approaches. Two types of incentives that may be used to encourage polluters to reduce or eliminate the emission of pollutants into the atmosphere are economic incentives and enforcement of regulations. Equipment tax credits, award payments, and emission fees are among the approaches available as economic incentives. The present trends in the U. S. indicate greater use of regulations than of direct cost-sharing incentives.
APTIC-18221

LEGISLATING FOR AIR QUALITY MANAGEMENT: REDUCING THEORY TO PRACTICE.

Law and Contemporary Problems, 33 (2):369-398,
Spring 1968. 71 refs.
George Hagevik.
Identifiers: *Air resource management, *Economic losses, *Legislation, *Socio-economic factors, *Abatement, New york state, New york city, Pollutants, Particulates, Sources, Industrial emission sources, Incinerators, Administrative and social, Administration, Budgets, Costs, Fees, Governments, Federal, Legal aspects, Regulations, Air quality standards.

This paper reviews some of the basic social science theory about the economics of air pollution and about decision making in general. This basic theory is then discussed in relation to the development of a hypothetical regulatory program for dealing with stationary sources of pollution. This hypothetical program is not based on existing control efforts but is conceived in the understanding that regulatory officals must be enabled to operate effectively even in the dim light of partial knowledge defining and relating the social and technological aspects of air pollution. The presentation is intended as a stimulus to new thinking about air quality management, and the organization for carrying it out.
APTIC-18222

OBTAINING BOILER FUEL GAS TO REDUCE AIR POLLUTION: THE POLICY OF THE FEDERAL POWER COMMISSION.

Law and Contemporary Problems, 33 (2):399-420,
Spring 1968. 67 refs.
Barry D. Rein.
Identifiers: *Federal power commission, *Natural gas, *Steam plants, *Legal decisions, California, Los angeles, Florida, New york state, New york city, Pollutants, Sources, Fuels, Coal, Fuel gases, Fuel oils, Industrial emission sources, Power production, Stacks, Control equipment, Electrostatic precipitation, Control methods, Sulfur oxides control, Desulfurization of fuels, So2 removal (combustion products), Atmospheric phenomena, Meteorology, Stability (atmospheric), Inversion, Acids, Inorganic, Sulfuric, Sulfur oxides, Sulfur trioxide, Administrative and social, Abatement, Governments, Federal, Legal aspects, Codes, Decisions, Sulfur dioxide, Humans.

Generation of electrical power by fossil fuels invariably produces pollutants; the particular pollutants produced and their effects vary with the type of fuel, the location of the plant, the type of generating unit, the existence of pollution control equipment, and the scheduling of particular fuels in multi-fuel plants. This article deals with an aspect of utilities regulation of particular importance: The jurisdiction of the Federal Power Commission (FPC) over the use by steam-electric generatig utilities of natural gas for boiler fuel, for the purpose of reducing air pollution produced by burning alternative fuels.
APTIC-18223

FIRST STEPS TOWARD EUROPEAN COOPERATION IN REDUCING AIR POLLUTION--ACTIVITIES OF THE COUNCIL OF EUROPE.

Law and Contemporary Problems, 33 (2):421-426,
Spring 1968. 4 refs.
G. Adinolfi.
Identifiers: *Council of europe, *International control agencies, *Control programs, Europe, Administrative and social, Administration, Advisory services, Control agencies, Governments, Meetings, International.

The European Conference on Air Pollution was convened by the Council of Europe from June 24 to July 1, 1964, in Strasbourg. Reports on fourteen items were presented for discussion by government experts from the different European countries represented. On the basis of these reports general reports on each of the 14 points on the agenda were prepared. The results of the Conference were examined and the Committee of Ministers adopted a Resolution 66 (23) on Air Pollution. The importance of these first steps towards cooperation mainly in the fields of legislation, administration, and information cannot be stressed too much. However, multilateral work in an intergovernmental organization is always extremely difficult and lengthy.
APTIC-18224

RECOMMENDED APPLICATION PROCEDURE FOR CERTIFICATION OF NEW GASOLINE ENGINES FOR USE IN HEAVY DUTY VEHICLES --1971 MODEL YEAR--.

National Air Pollution Control Administration,
Ypsilanti, Michigan, Div. of Motor Vehicle
Pollution Control, 31p., (1970).
Personal Author Not Recorded.
Identifiers: *Automotive emission control, Automotive emissions, Engine exhausts, Crankcase emissions, Fuels, Transportation, Power sources, Internal combustion engines, Spark ignition engines, Vehicles, Buses, Trucks, Measurement methods, Control methods, Engine operation modification, Engine design modification, Testing facilities, Administration, Plans and programs, Control programs, Enforcement procedures.

This request form consists of two parts, each to be submitted to NAPCA at a different stage of engine development. The Preliminary Application, due before engine testing has begun, is a definitive description of all the various gasoline engines offered for sale by a manufacturer. This information is used by NAPCA to specify appropriate types and numbers of gasoline engines for the emission and durability tests. Required information includes fuel analysis results, engine specifications, test facility description and testing schedule, proposed emission system description, and expected durability data. The Final Application is due 60 days before certification is desired. An addendum to the first part, it presents all technical data required to substantiate that the new gasoline engines meet Federal requirements for exhaust emissions. This includes the results of durability and emission tests, and data describing engine performance.
APTIC-18233

THE LEGAL ARRANGEMENT AND ORGANIZATION OF THE PROTECTION OF THE ATMOSPHERE IN CZECHOSLOVAKIA.

(Pravni uprava a organizace ochrany ovzdusi v
CSSR). Ochrana Ovzdusi, vol. 1, Jan. 1969.
Translated from Czech. Belov and Associates,
Denver, Colo., 22p., April 20, 1970.
J. Leden.
Identifiers: *Pollutants, *Legislation, Czechoslovakia, Combustion gases, Odors, Dusts, Fly ash, Fumes, Sulfur dioxide, Radioactive radiation, Control programs, Advisory services, Fees, Regulations, Maximum allowable concentration.

The Czechoslovakian Law No. 35/1967 Sb. has made it possible to create a system of effective measures against air pollution. Fees for atmospheric pollution must be paid by any pollutor that releases large amounts of noxious materials into the atmosphere, primarily ash and sulfur dioxide, in any degree that exceeds the given standards. The protection of the atmosphere is centralized directly by the Ministry of Forestry and Water Economy and the State Technical Inspection for the Protection of the Atmosphere. Tasks have also been allocated to the Hydrometeorological Institute. It is suggested that the validity of the law be expanded to include such pollutants as secondary dust, steam traction, exhaust gases from combustion engines, radioactivity, and noxious fumes.
APTIC-19723

AIR POLLUTION - RULE AND REGULATION.

IEEE (Inst. Elec. Electron. Engrs.) Trans. Ind.
Gen. Appl., IGA-5 (3):237-241, May/June 1969, 3

refs. (Presented at the IEEE (Inst. Elec. Electron. Engrs.) Cement Industry Technical Conference, St. Louis, Mo., May 21-24, 1968, Paper 68 TP64-IGA.
Bruce E. Kester.
Identifiers: *Cements, *Mineral processing, *Regulations, Stack gases, Dusts, Smokes, Electrostatic precipitators, Bag filters, Glass fabrics, Design criteria, Carbon monoxide, Nitrogen oxides, Sulfur dioxide.

A framework of increasing impetus for pollution control regulation and enforcement is established. The progression of air pollution control from early in-plant control of the working environment to community recognition of air pollution and black smoke control is traced. Today, in target areas of the nation, rules and regulations have been promulgated which govern particulate and sulfur dioxide emissions. In particulate emissions, the process weight table is being promoted. Manufacturers of pollution control equipment have asserted that they can install equipment in a cement plant to meet the process weight table. However, electrostatic precipitator manufacturers do not agree on basic design criteria to do the job. Glass bag collectors, while in basic agreement on cloth-to-gas ratio, get into equally confusing design differences as to preference of suction or pressure installations and many varied proposals for handling wet-process kilns. When the question of sulfur emissions from a cement plant arises, opinion with little factual data prevails. It is predicted that the process weight table will be uniformly applied in almost every air shed area. Sulfur dioxide will be restricted to the emission rates prevailing on the combustion of low sulfur coal. Studies of possible pollutants will be made, and air quality criteria established for nitrogen oxides, carbon monoxide, and other pollutants which do not directly concern the cement industry.
APTIC-19747

CONTROL OF AIR POLLUTION IN PENNSYLVANIA'S AIR QUALITY CONTROL REGIONS.

Preprint, UGI Corp., Harrisburg, Pa., lp., 1970.
(Presented at the Air Pollution Seminar, Harrisburg, Pa., March 24, 1970.)
J. K. Hambright.
Identifiers: *Control programs, *Air quality control regions, *Pennsylvania, Abatement, Control agencies, State governments, Legislation, Planning and zoning, Regulations, Air quality standards, Particulates, Sulfur dioxide.

Under the provisions of the federal Air Quality Act, two air quality regions were established in Pennsylvania. Air quality standards for sulfur dioxide and suspended particulate matter have been adopted by the state's Air Pollution Commission. An implementation plan outlining the procedures for achieving the adopted air quality standards is being prepared for the consideration and approval of the federal government. The plan suggests a new regulation for control of sulfur dioxides and utilization of existing Commission Regulations 4 and 5 for control of particulate matter. Objectives of the federal Air Quality Act and the state Air Pollution Control Act can be achieved only by cooperative action between industry and the control agency. (Author abstract)
APTIC-19775

COORDINATING AND UNIFYING THE NATION'S ATTACK ON AIR POLLUTION.

Preprint, UGI Corp., Harrisburg, Pa., 1p., 1970.
(Presented at the Air Pollution Seminar, Harrisburg, Pa., March 24, 1970.)
George William Walsh.
Identifiers: *Control programs, *Clean air act, Abatement, Control agencies, Air quality criteria, Federal governments, Air quality standards.

The activities of the Federal air pollution control program as it has evolved under the Clean Air Act and its amendments in 1965 and 1967 are described. Present efforts in the designation of air quality control regions, issuance of air quality criteria and control technology documents, and the review of proposed air quality standards and implementation plans are discussed. An outline is presented of President Nixon's proposed amendments of 1970 and other proposals that have been presented to Congress. The main issue is no longer concerned with the need for control nor the degree of control but the speed and effectiveness with which clean air can be achieved. (Author abstract modified)
APTIC-19776

PARTIAL AMENDMENT OF THE NOV. 1968 NOTIFICATION NO. 2 OF THE MINISTRIES OF HEALTH AND WELFARE AND OF INTERNATIONAL TRADE AND INDUSTRY SPECIFYING THE EMISSION STANDARDS FOR DESIGNATED AREAS UNDER THE PROVISIONS OF THE AIR POLLUTION CONTROL LAW.

For primary bibliographic entry see Field 11.
APTIC-19782

RESULTS OF QUESTIONNAIRE SURVEY ON COMMUNITY AIR QUALITY STANDARDS CONDUCTED AMONG STATE AND LOCAL AIR POLLUTION AGENCIES.

Preprint, Michigan Univ., Ann Arbor, 15p., 1962.
(Presented at the Seminar on Community Air Quality Standards, Ann Arbor, Mich., June 11-14, 1962.)
Personal Author Not Recorded.
Identifiers: *Control agencies, *Opinion surveys, *Air quality standards, Costs, Federal governments, Local governments, State governments, Questionnaires, Emission standards.

A questionnaire was sent to all full-time local and state agencies listed in the 1962 Directory of Governmental Air Pollution Agencies. Those that responded are indicated and observations are made. More than one set of Ambient Air Quality (AAQ) standards may be needed- one for use in localized areas near major sources of pollution and another for the general community air supply. Several comments cited the need to relate emission standards to AAQ standards for specific areas, giving consideration to source strength, and meteorology, but most agencies feel emission standards would be more useful tools for achieving clean air than would be AAQ standards. Most agencies agree that the amount of health impairment is a very important factor but approximately 9% feel this factor is of slight importance. Many agencies attach only slight importance to the cost of controlling pollution which accrues to industry and to the community. It was felt by 65% of the local agencies and 32% of the state agencies that the Federal government should promulgate standards to protect health, but local agencies were somewhat unified that they should set their own standards to prevent nuisances and to a lesser extent standards to prevent property damage. All agencies feel that adoption of AAQ standards will have a significant effect on their personnel and equipment requirements. Smaller state agencies feel it would take several years to secure needed legislation and financial support.
APTIC-19784

PROGRAM PLANNING IN INHALATION CARCINOGENESIS: NATIONAL CANCER INSTITUTE PLANS.

For primary bibliographic entry see Field 07.
APTIC-19836

AIR POLLUTION CONTROL LEGISLATION IN WEST GERMANY.

Staub (English translation from German of: Staub, Reinhaltung Luft), 29 (9):3-7, Sept. 1969, 30 refs.
CFSTI: TT 69-55002/9
Hans Wiethaup.
Identifiers: *Abatement, *Legislation, *Germany, Federal governments, Codes, Regulations.

A summarizing report on the laws, orders, regulations, and ordinances concerning air pollution control which are valid at present (1969) in the German Federal Republic is given. The content of decisive administrative decisions issued by the Federal Government and by individual Land Governments is included. The various states without special clean air regulations are listed, and their intentions in this area are summarized. The concentration of industry and people in most West German territories requires a comprehensive air pollution law. The absence of a uniform law of this type must be regarded as a serious omission.
APTIC-19957

THE SIGNIFICANCE OF THE EUROPEAN CHARTER FOR AIR POLLUTION CONTROL TO WEST GERMANY.

Staub (English translation from German of: Staub, Reinhaltung Luft), 29 (9):1-3, Sept. 1969.
Heinrich Oels.
Identifiers: *Abatement, *Legislation, *Europe, Governments, Germany.

The European Air Pollution Charter calls upon member states of the Council of Europe to take all legal and administrative measures necessary to prevent and diminish every kind of air pollution. The governments of the member states are urged to enact legislation requiring pollution sources to limit pollutants to minimum levels, to dispose of residual emissions, and to bear the major burden of control costs. The member states are also asked to plan for future contingencies through measurements of the extent and frequency of emissions, geographical factors, and future population density. Governmental support is suggested for the development of new control technology. The introduction of common norms is asked for the design and operation of European motor vehicles and mass-produced furnace equipment. The Charter would subject air pollution in border regions to joint examination by the states concerned and permit citizens of a neighboring state to appeal the construction of border installations liable to have deleterious effects. Implications of the Charter for West Germany are noted.
APTIC-19965

THE IMPORTANCE OF PROTECTION AGAINST IMMISSION FOR VEGETATION.

For primary bibliographic entry see Field 08.
APTIC-19969

A PROPOSED AIR POLLUTION TERMINOLOGY.

Staub (English translation from German of: Staub, Reinhaltung Luft), 29 (9):10-12, Sept. 1969, 3 refs.
CFSTI: TT 69-55002/9
Bernd Prinz, and Heinrich Stratmann.
Identifiers: *Administrative and social, Public affairs, Germany.

Some essential terms in the field of air pollution are revised to provide for unambiguous scientific interpretation. This revision is made necessary because of legal influences on the terminology. Emission is defined as an occurrence where the atmosphere begins to influence the motion of foreign substances or where the onset of such an influence is possible at a very early period. Transmission takes place where the influence of the atmosphere upon the motion of foreign substances has reached a maximum. Immission occurs where the influence of the atmosphere upon the motion of extraneous substances ceases or where this influence is still barely possible. Definitions for other derived terms such as rate, supply, installments, criteria, characteristic values, and limiting values are also given.
APTIC-19974

ROLE OF NATURAL GAS IN THE STRUGGLE AGAINST AIR POLLUTION.

For primary bibliographic entry see Field 02.
APTIC-22031

HOW POLLUTION WATCHERS IGNORE FACTS IN COPPER INDUSTRY'S SO2 EMISSIONS.
Eng. Mining J., vol. 171:98-101, Aug. 1970. 6 refs.
Eugene Guccione.
Identifiers: *Abatement, *Regulations, *Primary metallurgical processing, *Sulfur dioxide, Governments, Emission standards, Copper, Stack gases.

New and stringent air-pollution control regulations have been passed in Utah, Montana, Arizona, and Washington requiring copper companies to limit sulfur emissions from smelters' smokestacks to 10% of the total sulfur present in the concentrate ore. As if technology could be created by majority vote, it is objected that the procedure of setting standards via public hearings will continue to produce unreasonable regulations that will leave pollution unabated while greatly harming industry. Industry's frustration regarding anti-pollution regulations, in the case of copper companies, is that it can operate only within the limits of existing technology. The Arthur G. McKee and Co. report of 1969 is cited as having pointed out to HEW the difficulty in recovering sulfur oxides from smelter gases. It is suggested that while technology takes its course, a good place to begin solving the problems of pollution is in the judiciary branch of government, not in the legislative and executive branches. Lack of agreement between the various methods for sulfur dioxide measurement is also pointed out, as well as the difficulty in establishing a clear-cut cause and effect relationship between air pollutants and impairment of health.
APTIC-22045

THE FUTURE IN AIR POLLUTION CONTROL.
For primary bibliographic entry see Field 02.
APTIC-22059

14. GENERAL AND MISCELLANEOUS

CARS AND AIR POLLUTION.
Bull. Atomic Sci., 25 (8):35-37, Oct. 1969.
Laura Fermi.
Identifiers: *Social attitudes, *Automobiles, Pollutants, Automotive emissions, Sources, Fuels, Fuel gases, Gasolines, Industrial emission sources, Electric power production, Nuclear power plants, Steam plants, Transportation, Power sources, Electric propulsion, Gas turbines, Internal combustion engines, Steam engines, Vehicles, Hydrocarbons, Nitrogen oxides, Administrative and social.

The Cleaner Air Committee of the Hyde Park-Kenwood community in Chicago has assembled some facts and raised some questions relating to air pollution from cars and from stationary sources. This discussion of the committee's findings is presented in the hope of eliciting further discussion of the subject.
APTIC-16884

NEW TANKER TRENDS.
Energy Memo, 4 (3):3p., July 1968.
Edward Symonds.
Identifiers: *Costs, *Fuel oils, *Ships.

As the result of reduced construction costs, new waves of 200,000-ton and 312,000-ton tankers are expected to be in service by the 1970's. By then six ports in Western Europe, and possibly others in the Far East, will have been expanded to accommodate the giant tankers. Many of the new tankers are expected to be financed and owned by oil companies, which formerly chartered more tonnage than they owned. With the rapid growth in the volume of oil to be shipped and with transportation costs sometimes amounting to as much as 20% of total product costs, investments in tankers has become a more attractive use of capital. In addition, ownership brings advantages of control and economy that are not provided even by long-term charters. However, oil companies and shipyards must take into account the prospect of a renewed tanker surplus and greater volatility in the spot market.
APTIC-19866

MAXIMUM GAS CONCENTRATION AT GROUND LEVEL FROM INDUSTRIAL CHIMNEYS.
J. Inst. Fuel (London), vol. 30:329-338, June, 1957. 9 refs. (Presented to The Institute of Fuel, London, Feb. 13, 1957.)
A. C. Best.
Identifiers: *Ground level, *Stacks, *Stack gases, Great britain, Design criteria, Height finding, Mathematical analyses, Plume behavior, Winds.

The ground level concentration of gas emitted from a chimney reaches a greatest value at a particular distance downwind from the chimney. Both the distance and the concentration itself depend upon the design characteristics of the chimney and upon the meteorological conditions. If the height to which the plume of gas rises above the chimney, owing to heating or velocity of efflux, is known, the maximum concentration likely to occur in any weather conditions can be calculated. It is this maximum concentration which is of interest when the stack is being designed. Several formulae for computing the height of rise have been published. The results of using three of these formulae are considered. For the purpose of computing maximum ground-level concentration the three are in reasonable agreement. A discussion regarding the various formulae and theoretical considerations are included. (Author abstract modified)
APTIC-19996

APPLICATIONS OF AEROSPACE TECHNOLOGY IN AIR POLLUTION CONTROL. (FINAL REPORT).
NASA Contract NSR-34-004-056, RTI UE-411-3, 65p., June 1969. CFSTI: N69-36186
Personal Author Not Recorded.
Identifiers: *Aerodynamics, Blood gas analysis, Odors, Trace analysis, Measurement methods, Absorption, Adsorption, Air-fuel ratio, Temperature sensing instruments, Fluorine compounds, Methanes, Carbon dioxide, Carbon monoxide, Nitric oxide (no), Nitrogen dioxide (no2), Sulfur dioxide, Combustion.

The Technology Application Team of the Research Triangle Institute, Research Triangle Park, N. C. acts as an information and technology interface between the National Aeronautics and Space Administration and National Air Pollution Control Administration and as a catalyst among the various sources of information involved in the technology. It identifies very specific technology-related problems and prepares air pollution problem abstracts on each specific requirement which describes the problems in a concise manner using functional nondisciplinary terminology. The specifically described problems include automobile drivers performance tests; remote temperature and wind vector sensing techniques for the lower 2 km of the atmosphere; long-term geophysical effects of carbon dioxide and of particles in the 0.2 to 0.5 micron size range; development of advanced pollutant sensors for methane, sulfur dioxide, fluorine, carbon dioxide, total hydrocarbons, carbon monoxide, nitric oxide, nitrogen dioxide, and total oxides of N2; improvement of adsorption and absorption techniques for removing pollutants from carrier gas streams; instrumentation for the investigation of flame chemistry; effect of trace qualitites of metals and impurities on pollutant identity and output in combustion; analytical techniques for the trace metals in combustion effluent and waste gases from metal processing, both in collected particles and in situ; fluidized bed combustion processes; working fluids for Rankine cycle engines; heat transfer to small gas-borne particles; physical consideration in optimizing fuel-air mixture; measuring techniques for air-borne particulates; and gas exchange capacity of lungs. Other problems mentioned, but not specifically described are oder classification and identification; development of advanced pollutant sensors for As, Be, Hg, Ni, NH3, carcinogens, Cl and HCl, H2S, V, ozone, Br, Ce, F, I, Pb, reactive hydrocarbons, and Cd; holographic techniques for measuring particulate flux, and combustion chamber aerodynamics.
APTIC-20495

AIR POLLUTION.
In: Handbook of the San Francisco Region. Palo Alto, Calif., Environment Studies, 1969, p. 284-309. 29 refs.
Robert H. Dreisbach.
Identifiers: *Respiratory diseases, *Pollutants, *Sources, Carboxyhemoglobin, Hemoglobin interactions, Mortality, Eyes, Lungs, Pulmonary function, Lung cancer, Cardiovascular diseases, Eye irritation, Bronchitis, Emphysema, Influenza, Pneumonia, Tuberculosis, San francisco, Engine exhausts, Blowby, Fuel tank evaporation, Carburetor evaporation losses, Oxidants, Smokes, Fuel oils, Petroleum refining, Primary metallurgical processing, Missiles and rockets, Sewage, Internal combustion engines, Automobiles, Sulfuric acid, Hydrocarbons, Beryllium compounds, Lead compounds, Carbon monoxide, Nitrogen oxides, Sulfur dioxide, Sulfur trioxide, Ozone, Hydrogen sulfide, Chronic.

The major types of air pollutants in the San Francisco Bay area, and their sources and effects, are discussed. Such respiratory diseases as bronchitis, emphysema, influenza, pneumonia, and tuberculosis have a close relationship with the level of air pollution. A strong correlation of lung cancer exists in men who smoke, and the incidence of lung cancer in California has increased from 15/100,000 in 1950 to 26.7/100,000 in 1967. Automobiles are the largest source of carbon monoxide. The presence of CO in the blood reduces the availability of oxygen to the tissues in two ways: by direct combination with hemoglobin to reduce the amount of hemoglobin available to carry oxygen, and by preventing the release of some of the oxygen at the low oxygen partial pressure present in body tissues. It is believed that long-term exposure to CO may contribute to chronic disease. Missile fuels, explosives, cigarettes, and agricultural wastes liberate nitrogen oxides. Long exposure to 50 ppm nitrogen dioxide has caused inflammatory changes in the lungs, and higher concentrations have been fatal. Sulfur oxides come from fuel oil combustion, petroleum refining, and from the chemical and metallurgical industries. Hydrogen sulfide is produced by bacterial action on sewage effluents containing large amounts of sulfur compounds, and it can cause eye irritation and sensory loss. The constituents present in particulate matter include lead, beryllium, carbon, other metals, and organic particulates. Their sources and effects on human health are also discussed.
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CHIMNEYS AND THE DISPERSAL OF SMOKE.
J. Inst. Fuel (London), vol. 28:530-545, 1955. 24 refs. (Presented at The Institute of Fuel, London, Nov. 9, 1955.)
J. E. Hawkins, and G. Nonhebel.
Identifiers: *Stack gases, *Smokes, *Diffusion, Great britain, Design criteria, Height finding, Plume behavior, Point sources, Winds, Lapse condition.

To avoid parts of a smoke plume being blown rapidly to ground by local disturbances of the wind, it is necessary to choose minimum heights of chimney and exit velocities of flue gases, which are related to the height of surrounding buildings, diameter of chimney and local ground contours. Even when the smoke avoids these disturbances, part of it, considerably diluted, reaches the ground at distances beyond about 6 times the effective height of the chimney. This effective height is the sum of the actual height and a function of the temperature, volume and velocity of the gases at the mouth of the chimney. Theoretical formulae which

have been developed for the calculation of smoke concentration at ground level, at any distance from the chimney, and the rate of dust and grit deposition are discussed and presented in a form suitable for use by design engineers, together with the supporting evidence from direct measurements. The agreement is sufficiently good for most design purposes. The meteorological background of the problem, including turbulent diffusion, diurnal variation of lapse rate, and wind speed, is discussed. (Author abstract modified)
APTIC-22006

ENGLAND IS CUTTING ITS AIR POLLUTION.
Elec. World, 174 (4):42-44, Aug. 15, 1970.
W. C. Davidson.
Identifiers: *Stacks, *Electric power production, *Diffusion, *Sulfur dioxide, Legislation, Great britain, Coal, Fuel oils, Monitoring, Ground level, Dispersion, Plume behavior, Winds, Sulfur trioxide.

Sulfur dioxide monitoring and other experiments in power-plant diffusion techniques are reported, nearly 20 years following the great London smog of 1952. As a result of a public inquiry by the National Society for Clean Air, the British government passed the 1956 Clean Air Act, and a further act in 1968 has lead to a modernization of industrial heating equipment and great improvements in the domestic fire. While emission of SO_2 from power stations has increased by 35% over the past ten years, ground-level concentrations have fallen by as much as 30%. In Britain, the answer to the sulfur problem is seen exclusively in high-level dispersion through very tall chimneys. These stacks are of multiflue design, one flue per unit. This maintains the full efflux velocity with just one unit in operation, allows maintenance without shutting down the whole station, and permits access to the aircraft warning lights at any time via internal elevators. Monitoring has shown that the modern power station makes no contribution to ground-level SO_2 pollution at times when there is high pollution from other sources (i.e., during fogs and temperature inversions) because the hot plume penetrates into the moving air above. Maximum pollution from the power station occurs at times of strong surface winds. At a station in Eggborough, use is made of a nearby 1250-ft TV mast to study plume dispersion at really close quarters; telemetered instrumentation is sending 6-million readings a year for computer processing. Sulfur trioxide is also produced, but trace amounts are beneficial from an engineering point of view, for the SO_3 provides a conductive layer on the fly ash which significantly improves precipitator efficiency. The use of coal or oil to provide fuel for the power station is also discussed.
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